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The experiences of pregnant women with gestational diabetes mellitus: a systematic review of qualitative evidence protocol

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The experiences of pregnant women with gestational diabetes mellitus: a systematic review of qualitative evidence protocol

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ABSTRACT

Introduction The incidence of gestational diabetes mellitus (GDM) is increasing. GDM can cause severe adverse effects for pregnant women and their fetuses. This systematic review is proposed to explore women's experience during pregnancy with GDM. This study will help understand physiological and psychological changes and family life experiences of pregnant women with GDM, as well as why their blood glucose is not well controlled and the difficulties they face and the help they need.

Methods and analysis The databases we will search include PubMed, CINAHL, Embase, PsycINFO, China Biology Medicine disc, China National Knowledge Infrastructure, VIP Database for Chinese Technical Periodicals, The Cochrane Library, ISI Web of Science, and JBI Database of Systematic Reviews. Published qualitative evidence of life change events or life experience of the women with GDM will be searched. There will be no limits on publication year. Two reviewers (JH and YW) will independently use the Joanna Briggs Institute (JBI) Critical Appraisal Checklist for Qualitative Research for methodological validity prior to inclusion in this review. Any disagreements regarding article evaluation will be resolved through discussion or with a third reviewer (XC). Data will be extracted using the standardized data extraction tool from JBI System for the Unified Management of the Assessment and Review of Information (SUMARI). Synthesis will include inductive subject analysis, including in-depth reading, coding research findings, developing topics, and re-coding to produce higher-level analysis topics. The final synthesized findings will be graded according to the ConQual approach for establishing confidence.

Ethics and Dissemination The study does not require ethical approval as primary data will not be collected. Results of this systematic review will be submitted to peer-reviewed international journals for publication and be presented in relevant international conferences.

Strengths and limitations of the study

- ▶ There is an urgent need to synthesize qualitative evidence about GDM women's experiences from diagnosis to the end of childbirth so that we can provide insights into GDM interventions.
- ▶ Results of this review will identify strengths and weaknesses of the current literature regarding GDM women's experiences.
- ▶ Systematic review of qualitative empirical evidence only includes studies from multiple regions and cultures, so the findings are more likely to be transferable and of relevance to contexts of GDM nursing.
- ▶ The limited retrieval database could not fully capture the experience of women with GDM.

PROSPERO registration number CRD42019132065

Introduction

Pregnancy is associated with a certain degree of hyperinsulinemia and insulin resistance. For some women, these physiological changes can lead to a high risk of gestational diabetes mellitus (GDM). GDM is a condition in which women without previously diagnosed glucose intolerance exhibit high blood glucose levels during pregnancy, particularly during their third trimester, and usually blood glucose was restored to normal around the time of birth.¹ According to the latest diagnostic criteria established by the International Association of Diabetes and Pregnancy Study Groups (IADPSG) in 2010, the GDM prevalence was estimated at 9.8–25.5% worldwide.² Current known risk factors for GDM include maternal age, race/ethnicity, parity, body mass index (BMI), hypertension, and smoking status.³

As there are few or no symptoms, pregnant women are usually unaware the GDM until it is diagnosed at routine prenatal screening.⁴ Compared with healthy pregnant women, many serious pregnancy complications are associated with GDM. GDM has serious adverse effects on the health of both the mother and the infant. GDM can directly lead to the cesarean section and increased risk of labor induction of the pregnant mother, and many other complications such as hypertension, dystocia, excessive amniotic fluid, shoulder dystocia, vaginal injury during labor, increased cesarean section rate, abortion, and fetal malformation.^{5 6} For the fetus, high risk of complications of GDM include perinatal mortality, fetal intrauterine growth retardation, and macrosomia.⁷ Exposure to GDM pregnancy in utero has been shown to induce long-term effects in offspring, such as increased incidence of type 2 diabetes mellitus (T2DM), cardiovascular alterations such as hypertension, metabolic syndrome, and obesity.⁸⁻¹⁰ Additionally, an exposure to maternal GDM is an independent risk factor for long-term neuropsychiatric morbidity in the offspring.¹¹ Women with GDM have a substantially increased risk for development of T2DM. The risk of T2DM in women with GDM was seven times higher than the risk of T2DM in normal pregnant women.^{12 13} For women with GDM, 35-50% of them may have recurrence GDM in subsequent pregnancies.¹⁴

Due to negative consequences of GDM to pregnant women and the infants, intervention studies on GDM treatments have been developed to improve maternal and newborn health outcomes.¹⁵ Current interventions primarily include glucose monitoring dietary, physical activity, pharmacological hypoglycemic agents (oral hypoglycemic agents or insulin), health education, psychological, and selective combine intervention.¹⁶ Until now, clinical guidelines

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3 differ with regard to diagnostic cutoff criteria of GDM. Great effort to adopt the criteria
4 proposed by IADPSG will warrant large cohort studies of GDM, which will provide medical
5 and economic justifications for such changes.¹⁷ Many studies have been published on the issue
6 of diagnosis, testing, and treatment of GDM. However, the experiences of women diagnosed
7 with GDM during treatment are still not well studied.¹⁸ GDM is associated with lifestyle
8 changes and emotional reactions due to the treatment.¹⁹ Information about the diagnosis may
9 be distressing to women.^{20 21} Pregnant women receive certain types of health guidances from
10 medical institutions after the diagnosis of GDM; however, how they accept and manage the
11 required behavior changes needs to be further studied.²² For instance, many women with GDM
12 perceive family guidance as a responsibility and also lack support from family and society. An
13 inadequate social and family support can create barriers to behavioral changes and social
14 isolation, and therefore these healthy behavioral changes will be difficult to be emaintained.²³

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26 It was a distressing experience for many women with GDM, with the shock of diagnosis
27 followed by self-accusation and anxiety for the unborn baby or, for some, motivation to take
28 control of their health during pregnancy such as managing GDM by following directed lifestyle
29 changes.^{25 26} But there are also large numbers of women who are not trying to change their
30 behaviors.²⁷ Due to the poor prognosis and long-term effects of GDM, the physiology and
31 psychology of pregnant women diagnosed with GDM during pregnancy were changed. Based
32 on their diagnosis and treatment of GDM, we proposed to understand the experience and
33 feelings of pregnant women in this special group. The impact of GDM on pregnant women's
34 life experience, reaction experience, and how to manage GDM will also be discussed to guide
35 clinical interventions.

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37 After the diagnosis of GDM, the self-recognition of pregnant women began to
38 reorganize.²⁸ On one hand, the diagnosis of GDM gave some motivations for some pregnant
39 women to actively understand self-management knowledge and participate in self-management
40 interventions. On the other hand, due to concerns about their health status, the outcome of the
41 disease, the childbirth situation, the child's health status and long-term development, the
42 psychological state pregnant women with GDM fluctuates significantly.²⁹ These changes in
43 mood can lead to corresponding changes and adjustments in lifestyles.³⁰ However, presenting
44 a positive or negative attitude and lifestyle is related to personal experience and value
45 orientation. Taken together, pregnant women with GDM indicated that the diagnosis of GDM
46 seriously affects their self-cognition and causes their negation of self-worth.³¹

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48 As GDM leads to negative outcomes to pregnant women, GDM patients during pregnancy

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generally have psychological experiences, such as shock, stimulation, panic, numbness, depression, disappointment, sadness, anxiety, and worry.²⁵ Another emotional experience brought about by gestational diabetes is “out of control”.³² During this period, most pregnant women expressed that their main emotional reactions were more confusion and fragility. The uncertainty about their own and the future health of the fetus made them unable to relax. In addition, constantly changing and adjusting the way of life make them feel uncomfortable. In addition, some women emphasized that they often feel inconvenience in social situations because of their diagnosis of GDM and their need to follow specific dietary requirements.³³ This is one type of pressure for some women, meaning that they tend to conceal their condition or reveal their condition and bring a sense of “social shame” and defining themselves as “unhealthy individuals”.

The social environment and cultural factors experienced by women are crucial to understand the life feeling of pregnant women with GDM. An individual’s behavioral choices cannot be separated from the influence of the environment.²⁹ Women with different cultural backgrounds and cultural expectations have different perceptions of healthy diet, and there are also significant differences in adherence to maintaining healthy eating behaviors according to GDM management requirements.²⁵ For example, Swedish pregnant women with GDM generally exhibit positive self-management behaviors and are able to take a proactive lifestyle, while the former Yugoslavia has a negative attitude towards self-care and tends to enjoy life by deviating from suggestions about diet.³⁴

Some pregnant women said that they feel the barriers and challenges in managing themselves and want more attention and care. Social support is an important factor influencing their behavioral attitudes among pregnant women with GDM, including family members, friends, and health care professionals. Family members and friends not only provide spiritual support, but also relieve the helplessness of pregnant women and provide some indirect experience to pregnant women. Nevertheless, the majority of pregnant women said that professional support is conducive to the long-term healthy lifestyle of pregnant women with GDM, willing to actively contact with professional help to obtain enough information.²⁹ On the contrary, some pregnant women do not trust the advice given by health care providers, and believe that self-assessment and self-management can also play an effective role in maintaining physical condition.³⁵

It can be seen that some pregnant women want to achieve optimal glycemic control during pregnancy by through themselves, which involves dietary modification, exercise, self-monitoring of blood glucose (SMBG), and appropriate use of medication.³⁶ Self-care of

pregnant women with GDM is particularly important, but as continuous care needs to be further developed and improved, more professional self-care is should be the key to manage GDM. For some pregnant women, self-care however is an additional burden and barrier.²⁵ The barriers to self-care mainly include fatigue, economic problems, bad weather, transportation, housework, supply of healthy foods, food costs, food preparation, and family food preferences.²⁵

There are a large number of quantitative studies on GDM and relevant clinical guidance, but a large number of women still have difficulties in controlling blood glucose. Managing their GDM represented an enormous task that they would never be able to handle or take control of women conveyed the need to have significant willpower to make all the lifestyle changes required.³⁷ Pender's health promotion model mention that some factors influence a person to adopt a health behavior such as awareness of the importance of health, perception of health control, and perception of health status.³⁸ Therefore understanding the life experiences of pregnant women with GDM, as well as how they manage their blood sugar and the challenges they had will help prevent complications later in life for pregnant women and fetuses.

Methods

Inclusion criteria

Types of participants

This review will search and integrate studies of women with GDM during pregnancy. The studies will be eligible, regardless of women's age and whether they have pregnancies for the first time or not. The studies will be excluded, if women have other complications (e.g. preeclampsia pregnancy and hypertension of pregnancy), or mental health disorders.

Phenomenon of interest

This review will include studies that describe the experiences of women with GDM during pregnancy.

Context

The context will consider in the experience and feelings of women with GDM during pregnancy.

Types of studies

The review will consider studies that focus on qualitative studies including, but not limited to, study designs such as phenomenology, grounded theory, ethnography, action research, nursing methodology, management case, descriptive research, narrative, thematic analysis, and feminist research.

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Search strategy

The search strategy aims to find both published and gray literature. An initial limited search of PubMed will be conducted, followed by an analysis of MeSH text words contained in the title and abstract, and of the index terms used to describe the article. This will inform the development of a search strategy which will be tailored for each information source. A second search using all identified keywords and index entries will take place in all the relevant databases. Thirdly, the reference list of all identified reports and articles will be examined for additional studies that are relevant to the review. Previously published studies in English and Chinese will be considered for inclusion in the database. A full search strategy will be detailed in an appendix of the final report of this systematic review. As an example, a preliminary draft search done in PubMed is shown in Appendix I. All reference lists of studies selected after critical appraisal will be screened in order to identify additional studies which are not found by the earlier screening process. The reference list of all studies selected for critical appraisal will be screened for additional studies.

Information sources

The databases to be searched will include PubMed, CINAHL, Embase, PsycINFO, China Biology Medicine disc, China National Knowledge Infrastructure, VIP Database for Chinese Technical Periodicals, The Cochrane Library, ISI Web of Science and JBI Database of Systematic Reviews and Implementation reports.

The search for gray literature will include Opengrey and deep blue.

Study selection

Following the search, all identified citations will be collated and uploaded into EndNote X7 (Clarivate Analytics, PA, USA) with duplicates removed. Two independent reviewers (JH and YW) will screen titles and abstracts for assessment against the inclusion criteria of the review. Studies identified as potentially eligible or those without an abstract will have their full-text retrieved and their details will be imported into the JBI System for the Unified Management, Assessment and Review of Information (JBI SUMARI) (Joanna Briggs Institute, Adelaide, Australia).³⁹ Full-text of selected citations will be retrieved and assessed in detail against the inclusion criteria by two independent reviewers (JH and YW). Full text of selected studies will be retrieved and assessed in detail against the inclusion criteria. Full text studies that do not meet the inclusion criteria will be excluded, and reasons for exclusion will be provided in an

appendix in the final systematic review report. Included studies will go through a critical evaluation process, and any differences between the two reviewers will be resolved through discussion. If no agreement is reached, a third reviewer (XC) will participate.

Assessment of methodological quality

Qualitative papers selected for inclusion will be assessed by two independent reviewers (JH and YW) using the JBI Critical Appraisal Checklist for Qualitative Research for methodological validity prior to inclusion in the review.⁴⁰ This tool has been found to be more coherent and sensitive to effectiveness assessments than other commonly used tools. An extract summary of the appraisal items is listed in Figure 1. Any disagreements that arise between the reviews will be resolved through discussion or with a third reviewer (XC), chosen among the authors of this review. Studies that meet quality standards will be included, extracted, synthesized from the data, and reflected in the results and conclusions of this system review. Low quality literature will be reported.

Summary JBI Qualitative Assessment and Review Instrument(QARI)													
Record details/ Full reference	Is there congruity between the stated philosophical perspective and the research question or methodology?	Is there congruity between the research methodology and the research question or objectives?	Is there congruity between the research methodology and the methods used to collect data?	Is there congruity between the research methodology and the representation and analysis of data?	Is there congruity between the research methodology and the interpretation of results?	Is there a statement locating the researcher culturally or theoretically?	Is the influence of the researcher on the research, and vice-versa, addressed?	Are participants, and their voices, adequately represented?	Is the research ethical according to current criteria or, is there evidence of ethical approval by an appropriate body?	Do the conclusions drawn in the research report flow from the analysis, or interpretation of the data?	Score	seek further into	Comments (including reason for exclusion)
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	/10		

Figure 1: Joanna Briggs Institute quality appraisal tool.

Data extraction

Data will be extracted from papers independently by two reviewers (JH and YW) using the standardized data extraction tool from JBI SUMARI. The extracted data will include specific details (Figure 2) about the study groups, context, culture, geographical location, study methods, the phenomena of interest relevant to the review question (e.g. experiences of women with gestational diabetes during pregnancy in mental, physical, and family life), and detail research objectives. Findings and their illustrations will be extracted and assigned a level of

credibility.

Modified JBI data extraction form for FGM Systematic Review										
Study (Name and Authors)	Phenomena of interest	Methodology	Methods	Setting	Geographical	Cultural	Participants (Age, relevant number, sample)	Data analysis	Authors Conclusion	Comments

Figure 2: Data extraction tool to include all the results and findings sections of each included study.

Data synthesis

Qualitative research findings will be aggregated using JBI SUMARI with the meta-aggregation approach. This will involve the aggregation or synthesis of findings to generate a set of statements that represent that aggregation, then through assembling the findings and categorizing these findings on the basis of similarity in meaning. These categories are subjected to a synthesis in order to produce a single comprehensive set of synthesized findings, which can be used as a basis for evidence-based practice. Where textual pooling is not possible the findings will be presented in narrative form. Coding of findings, in time of the aggregation process to explore the influence, will be considered, about experiences of women with gestational diabetes during pregnancy. Two review authors will cluster independently the identified findings and then compare the generated categories, discussing discrepancies until reaching agreement. Finally, two review authors will work together to produce a comprehensive set of synthesized findings.

Assessing certainty in the finding

The final findings will be graded according to the ConQual approach for establishing confidence in the output of research synthesis and presented in a summary of findings. It will include the major elements of this systematic review and details how the ConQual score is developed. The summary of findings will include the primary study title, phenomena of interest and context for the special review. The flowchart (Figure 3) shows the whole protocol process, which was completed by two independently reviewers, and then combined with our analysis.

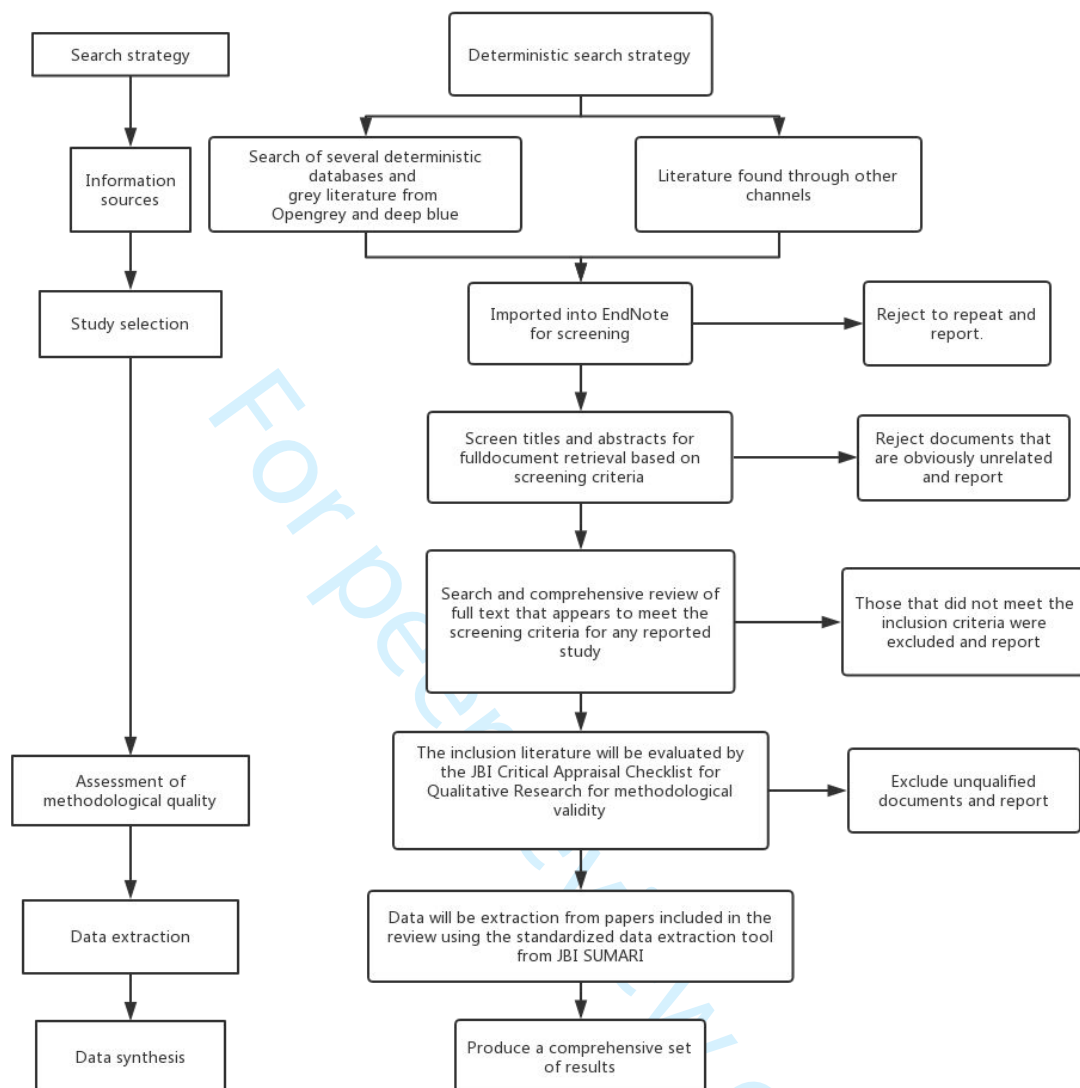


Figure 3: Search and selection process.

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Contributors JH and YW contributed to the conception of the study. The manuscript protocol was drafted and finished the introduction by JH and YW. JH, YW and XC drafted and finished the Methods sections with assistance from YL. And the protocol was revised by JB. All the authors developed the search strategy and JH and YW will also independently screen the potential studies, extract data from the included studies, assess the risk of bias and complete the data synthesis. XC will arbitrate in cases of disagreement and ensure the absence of errors. All authors approved the publication of the protocol.

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Conflict of interests

The authors declare that we have no conflict of interests.

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Appendix I: PubMed search strategy

#1 Diabetes, Gestational [mh] OR Diabetes, Pregnancy-Induced [tiab] OR Diabetes, Pregnancy Induced [tiab] OR Pregnancy-Induced Diabetes [tiab] OR Gestational Diabetes [tiab] OR Diabetes Mellitus, Gestational [tiab] OR Gestational Diabetes Mellitus [tiab] OR GDM [tiab] OR pregnancy diabetes mellitus [tiab]

#2 nursing methodology research [mh] OR research, nursing methodology [tiab] OR methodology research, nursing [tiab] OR nursing methodological issues research [tiab] OR clinical methodology research, nursing [tiab] OR organizational case studies [tiab] OR health services research [tiab] OR case stud*, organizational [tiab] OR studies, organizational case [tiab] OR management case studies [tiab] OR case studies, management [tiab] OR studies, management case [tiab] OR constant comparative method [tiab] OR constant comparison [tiab] OR content analysis [tiab] OR descriptive Research [tiab] OR discourse analysis [tiab] OR ethnography [tiab] OR exploratory [tiab] OR feminist [tiab] OR feminism [tiab] OR focus group* [tiab] OR grounded theory [tiab] OR hermeneutic* [tiab] OR interview [tiab] OR narrative [tiab] OR naturalistic [tiab] OR naturalistic inquiry [tiab] OR participant observation [tiab] OR phenomenology [tiab] OR qualitative method [tiab] OR qualitative research [tiab] OR qualitative stud* [tiab] OR thematic analysis [tiab]

#3 life change events [mh] OR event*, life change [tiab] OR life change event [tiab] OR life experience* [tiab] OR experience*, life [tiab] OR analysis, event history [tiab] OR analyses, event history [tiab] OR event history analyses [tiab] OR event history analysis [tiab] OR personal experience [tiab]

#4 #1 AND #2 AND #3

BMJ Open

The experiences of pregnant women with gestational diabetes mellitus: a systematic review of qualitative evidence protocol

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Primary Subject Heading:	Diabetes and endocrinology
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The experiences of pregnant women with gestational diabetes mellitus: a systematic review of qualitative evidence protocol

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[#] Jing He and Yuchen Wang contributed equally to this paper.

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ABSTRACT

Introduction The incidence of gestational diabetes mellitus (GDM) is increasing and an issue of global concern. GDM can cause severe adverse effects for pregnant women and their fetuses. This systematic review is proposed to explore women’s experiences during pregnancy with GDM. This review will provide insights into the physical, psychological, and social adaptation experiences of women with GDM that can help identify challenges of glycemic control and provide targeted care and interventions to improve maternal and child health.

Methods and analysis The databases we will search include English databases (i.e., PubMed, CINAHL, Embase, the Cochrane Library, Web of Science, Joanna Briggs Institute [JBI] Database of Systematic Reviews, PsycINFO, OpenGrey, and Deep Blue) and Chinese databases (i.e., China Biology Medicine disc, China National Knowledge Infrastructure, and VIP Database for Chinese Technical Periodicals). Published qualitative evidence of life changes or experiences of the women with GDM will be searched. There will be no limits on publication year. Two reviewers will independently use the JBI Critical Appraisal Checklist for Qualitative Research for methodological validity prior to inclusion in this review. Any disagreements regarding article evaluation will be resolved through discussion or with a third reviewer. Data will be extracted using the standardized data extraction tool from JBI System for the Unified Management of the Assessment and Review of Information (SUMARI). Synthesis will include in-depth reading of the original text and the discovery of the results, and then summarizing similar categories for more advanced synthesized findings. The final synthesized findings will be graded according to the ConQual approach for establishing confidence.

Ethics and Dissemination This study does not require ethical approval as primary data will not be collected. Results of this systematic review will be submitted to peer-reviewed international journals for publication and be presented in relevant international conferences.

Strengths and limitations of the study

- There is an urgent need to synthesize qualitative evidence about GDM women’s experiences from diagnosis to the end of childbirth so that we can provide insights into GDM management and interventions.
- Results of this review will identify strengths and weaknesses of the current literature regarding GDM women’s experiences.
- Systematic review of qualitative empirical evidence from multiple regions and cultures will facilitate the dissemination of findings regarding GDM and promote nursing practice in GDM.

►This review will not analyze the experiences of postpartum women.

PROSPERO registration number CRD42019132065

INTRODUCTION

Pregnancy is associated with a certain degree of hyperinsulinemia and insulin resistance. For some women, these physiological changes can lead to a high risk of gestational diabetes mellitus (GDM). GDM is a condition in which women without previously diagnosed glucose intolerance exhibit high blood glucose levels during pregnancy, particularly during their third trimester. The blood glucose is usually restored to normal around the time of birth.¹ The incidence of gestational diabetes mellitus (GDM) is increasing and an issue of global concern. According to the latest diagnostic criteria established by the International Association of Diabetes and Pregnancy Study Groups (IADPSG) in 2010, the prevalence of GDM was estimated as 9.8–25.5% worldwide.² The primary risk factors for GDM include maternal age, race/ethnicity, parity, body mass index (BMI), hypertension, and smoking status.³

As there are few or no symptoms, pregnant women are usually not aware of the GDM until it is diagnosed at a routine prenatal screening.⁴ Compared with healthy pregnant women, many serious pregnancy complications are associated with GDM. GDM has serious adverse effects on the health of both the mother and the infant. GDM can directly lead to cesarean section, and many other complications such as hypertension, abortion, and fetal malformation.^{5–6} For the fetus, high risk of complications of GDM include fetal intrauterine growth retardation and macrosomia.⁷ Exposure to GDM pregnancy in utero has been shown to cause long-term negative effects in offspring, such as increased incidence of type 2 diabetes mellitus (T2DM), cardiovascular alterations, hypertension, metabolic syndrome, and obesity.^{8–10} Additionally, exposure to maternal GDM is an independent risk factor for long-term neuropsychiatric morbidity in the offspring.¹¹ Women with GDM have seven-fold increased risk for T2DM compared to normal pregnant women.^{12–13} For women with GDM, 35–50% of those living with GDM may have recurrence GDM in subsequent pregnancies.¹⁴

Due to negative consequences of GDM to pregnant women and infants, intervention programs on GDM treatments have been developed to improve maternal and newborn health outcomes.¹⁵ Current interventions primarily include glucose monitoring dietary, physical activity, pharmacological hypoglycemic agents (oral hypoglycemic agents or insulin), health education, psychological, and selective combine intervention.¹⁶ Many studies have been

published on the issue of diagnosis, testing, and treatment of GDM. However, the experiences of women diagnosed with GDM during treatment are still not well studied.¹⁷ GDM is associated with lifestyle changes and emotional reactions due to treatment.¹⁸ Information about the diagnosis may be distressing to pregnant women.¹⁹ ²⁰ Pregnant women may receive certain types of health-related guidance from medical institutions after the diagnosis of GDM. However, how they accept and manage the required behavioral changes needs to be further studied.²¹ For instance, many women with GDM perceive family guidance as a responsibility and also lack support from family. An inadequate social and family support can create barriers to behavioral changes and social isolation, and therefore these healthy behavioral changes will be difficult to be maintained.²² ²³

Women who suffer from GDM may have distressing experiences, with the shock of diagnosis followed by self-accusation and anxiety for the unborn baby or motivation to take control of their health during pregnancy such as managing GDM by following detailed lifestyle changes.²⁴ ²⁵ But there are also a large number of women who are not trying to change their behaviors.²⁶ Due to the poor prognosis and long-term effects of GDM, the physiology and psychology of pregnant women diagnosed with GDM during pregnancy significantly altered. Quantitative studies related to GDM have provided some clinical guidance, such as the need for dietary management to effectively control blood glucose.²⁷ ²⁸ However, there are many challenges in the process of self-management, and it is very difficult for women to maintain a reasonable blood glucose level.²⁹

The purpose of this review is to gain a deeper understanding regarding diagnosis and knowledge of the disease of pregnant women with GDM, pregnant women’s beliefs about health, expectations of pregnancy outcomes and maternal and child’s future health, as well as challenges and needs during pregnancy. This review will provide insights into the physical, psychological, and social adaptation experiences of women with GDM that can help identify challenges of glycemic control and provide targeted care and interventions to improve maternal and child health.

Inclusion criteria

Types of participants

This review will search and integrate studies of women with GDM during pregnancy. Searched studies will be eligible regardless of women’s age and whether they have pregnancies for the first time or not.

Phenomenon of interest

This review will include studies that describe the experiences of women with GDM during pregnancy.

Context

The context will consider in the experiences and feelings of women with GDM during pregnancy.

Types of studies

The review will consider studies that focus on qualitative studies including, but not limited to, study designs such as phenomenology, grounded theory, ethnography, action research, nursing methodology, management case, descriptive research, narrative, thematic analysis, and feminist research.

METHODS

This review aims to synthesize experiences of women with GDM during pregnancy. The research question will be appropriately answered by qualitative studies. The initial scope of the literature search provides recommendations for the proposed syntheses. The topic synthesis approach involves the use of topic analysis techniques to identify key concepts or topics in primary studies, then form the title, and complete the title registration in Joanna Briggs Institute (JBI) System and PROSPERO. The registration number of PROSPERO is CRD42019132065.

Patient and public involvement

No patient will be involved.

Search strategy

The search strategy aims to find both published and gray literature. An initial limited search of PubMed will be conducted, following by an analysis of MeSH terms contained in the title and abstract, and of the index terms used to describe the articles. This will inform the development of a search strategy which will be tailored for each database source. A second and complete search using all identified keywords and index entries will take place in all the relevant databases. Thirdly, the reference list of all identified articles will be examined for additional studies relevant to this review. Previously published studies in English and Chinese will be considered for inclusion in the database. A full search strategy has been done (Appendix I).

Information sources

The databases to be searched will include English databases (i.e., PubMed, CINAHL, Embase, the Cochrane Library, Web of Science, Joanna Briggs Institute [JBI] Database of Systematic Reviews and PsycINFO) and Chinese databases (i.e., China Biology Medicine disc, China National Knowledge Infrastructure, and VIP Database for Chinese Technical Periodicals).The

search for gray literature will include OpenGrey and Deep Blue.

Study selection

Following the search, all identified studies will be collated and uploaded into EndNote X7 (Clarivate Analytics, PA, USA), with duplicates removed. Two independent reviewers (JH and YW) will screen titles and abstracts for assessment against the inclusion criteria of the review. Studies identified as potentially eligible or those without an abstract will have their full text retrieved and their details will be imported into the JBI System for the Unified Management, Assessment and Review of Information (JBI SUMARI).³⁰ Full texts of selected citations will be retrieved and assessed in detail against the inclusion criteria by two independent reviewers (JH and YW). Full texts that do not meet the inclusion criteria will be excluded, and reasons for exclusion will be provided in an appendix in the final systematic review report. Included studies will go through a critical evaluation process, and any differences between the two reviewers will be resolved through discussion. If no agreement is reached, a third reviewer (XC) will be involved.

Assessment of methodological quality

Qualitative papers selected for inclusion will be assessed by two independent reviewers (JH and YW) according to the 10 items checklist of the JBI Qualitative Assessment and Review Instrument (JBI-QARI) for methodological validity prior to inclusion in the review.³¹ This tool has been found to be more coherent and sensitive to effectiveness assessments than other commonly used tools. The evaluation content includes: methodology and philosophical perspective of the research, the research objectives, the methods used to collect data, analysis of data, the interpretation of results, if have statement for the influence of the researcher on the research, representativeness of the participants and the ethical and so on. All items were evaluated by using ‘yes’, ‘no’ and ‘unclear’ to appraisal. An extract summary of the appraisal items is listed in Figure 1. The 10 items were scored similarly as the quantitative index with less than or equal to 6 points representing a weak rating, 7 to 8 points representing a moderate rating, and 9 to 10 points representing a strong rating. References of the moderate rating or above will be included. Any disagreements that arise between the reviewers will be resolved through discussion or with a third reviewer (XC). Studies of the moderate rating or above will be included, extracted, synthesized from the data, and reflected in the results and conclusions of this system review. Low quality literature will be reported.

Data extraction

Data will be extracted from papers independently by two reviewers (JH and YW) using the

standardized data extraction tool from JBI SUMARI. The extracted data will include specific details (Figure 2) about the study groups, context, culture, geographical location, study methods, the phenomena of interest relevant to the review question (i.e., experiences of women with gestational diabetes during pregnancy in mental, physical, and family life), and detail research objectives. Findings and their illustrations will be extracted and assigned a level of credibility.

Data synthesis

Qualitative research findings will be aggregated using JBI SUMARI with the meta-aggregation approach. There are three steps to integrate findings of the original study. First, individual findings will be appraised and will achieve one of three outcomes: unequivocal (evidence beyond reasonable doubt); credible (contains illustrations that may be challenged); or unsupported (when findings are not supported). Second, findings of all included studies will be extracted and categorized to create a set of categories representing meaningful similarities. Third, these similar categories are subjected to a synthesis in order to obtain a single comprehensive set of synthesized findings, which can be used as a foundation for evidence-based practice. For example, findings included “beliefs about healthcare” and “wishing to receive caring GDM care” that can be summarized as a category of “the need for professional help”. The finding about “having a supportive environment” will be summarized as a category for “family support”. Then, the two categories are subjected to create a set of synthetic results called “difficulties and needs of women with GDM”. If textual pooling is not possible, findings will be presented in a narrative form. Coding of findings, in time of the aggregation process to explore the influence, will be considered, about experiences of women with GDM during pregnancy. Two review authors will independently cluster identified findings, compare the generated categories, and discuss discrepancies until reaching agreement. Finally, two authors of this study will work together to create a comprehensive set of synthesized findings.

Assessing certainty in the finding

The final findings will be graded according to the ConQual approach for establishing confidence in the output of research synthesis and presented in a summary of findings.³² The ConQual process was used to analyze the level of confidence or trust that exists in the value and level of evidence of each synthesized finding (Figure3). The figure will include the major elements of this systematic review and details on how the ConQual score is developed. The summary of findings will include the primary study title, phenomena of interest, and context for the special review. The flowchart (Figure 4) shows the whole protocol process, which was

completed by two independently reviewers, and then combined with our analysis.

PRESENTING AND REPORTING THE REVIEW

The resulting review will be reported in accordance with the ‘Enhancing Transparency in Reporting the Synthesis of Qualitative Research’ (ENTREQ) statement³³, which consists of 21 items and is appropriate for qualitative evidence synthesis (Table 1).

Table 1 Summary of the Enhancing Transparency in Reporting the Synthesis of Qualitative Research statement	
No	Item
1	Aim
2	Synthesis methodology
3	Approach to searching
4	Inclusion criteria
5	Data sources
6	Electronic Search strategy
7	Study screening methods
8	Study characteristics
9	Study selection results
10	Rationale for appraisal
11	Appraisal items
12	Appraisal process
13	Appraisal results
14	Data extraction
15	Software
16	Number of reviewers
17	Coding
18	Study comparison
19	Derivation of themes
20	Quotations
21	Synthesis output

DISCUSSION

This systematic review will discover women's experiences after being diagnosed with GDM during pregnancy and integrate these findings for a comprehensive and in-depth understanding of their difficulties and needs. Specific personal experiences of women with GDM can inform professional healthcare and provide personalized care and education for these women. Improved care will promote maternal and child health, and therefore reduce the medical burden.

This systematic review of qualitative evidence will be published in an open access, peer reviewed, and international journal for dissemination.

Acknowledgments We thank the librarian (Jin Chen) from Wuhan University for his guidance and assistance in retrieving the bibliographic database.

Contributors JH and YW contributed to the conception of the study. The manuscript protocol was drafted and finished the introduction by JH and YW. JH, YW and XC drafted and finished the Methods sections with assistance from YL. And the protocol was revised by JB. All the authors developed the search strategy and JH and YW will also independently screen the potential studies, extract data from the included studies, assess the risk of bias and complete the data synthesis. XC will arbitrate in cases of disagreement and ensure the absence of errors. All authors approved the publication of the protocol.

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Conflict of interests

The authors declare that we have no conflict of interests.

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Figure 1: Joanna Briggs Institute quality appraisal tool

Figure 2: Data extraction tool to include all the results and findings sections of each included study

Figure 3: ConQual Summary of Findings

Figure 4: Search and selection process

Appendix I: Search strategy

For peer review only

Summary JBI Qualitative Assessment and Review Instrument (QARI)													
Record details/ Full reference	Is there congruity between the stated philosophical perspective and the research question or methodology?	Is there congruity between the research methodology and the research question or objectives?	Is there congruity between the research methodology and the methods used to collect data?	Is there congruity between the research methodology and the representation and analysis of data?	Is there congruity between the research methodology and the interpretation of results?	Is there a statement locating the researcher culturally or theoretically?	Is the influence of the researcher on the research, and vice-versa, addressed?	Are participants and their voices, adequately represented?	Is the research ethical according to current criteria or, is there evidence of ethical approval by an appropriate body?	Do the conclusions drawn in the research report flow from the analysis, or interpretation of the data?	Score	seek further into	Comments (including reason for exclusion)
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	/10		

Figure 1: Joanna Briggs Institute quality appraisal tool.

Modified JBI data extraction form for FGM Systematic Review										
Study (Name and Authors)	Phenomenon a of interest	Methodology	Methods	Setting	Geographical	Cultural	Participants (Age, relevant number, sample)	Data analysis	Authors Conclusion	Comments

Figure 2: Data extraction tool to include all the results and findings sections of each included study.

Systematic review title: the experiences of the pregnant with gestational diabetes: a systematic review of qualitative evidence				
Population: persons who have been diagnosed with GDN during pregnancy				
Phenomena of interest: the exposition of the experiences of women with GDM during pregnancy				
Context: in the experiences and feelings of women with GDM during pregnancy				
Synthesized finding	Type of research	Dependability	Credibility	ConQual score

Figure 3: ConQual Summary of Findings

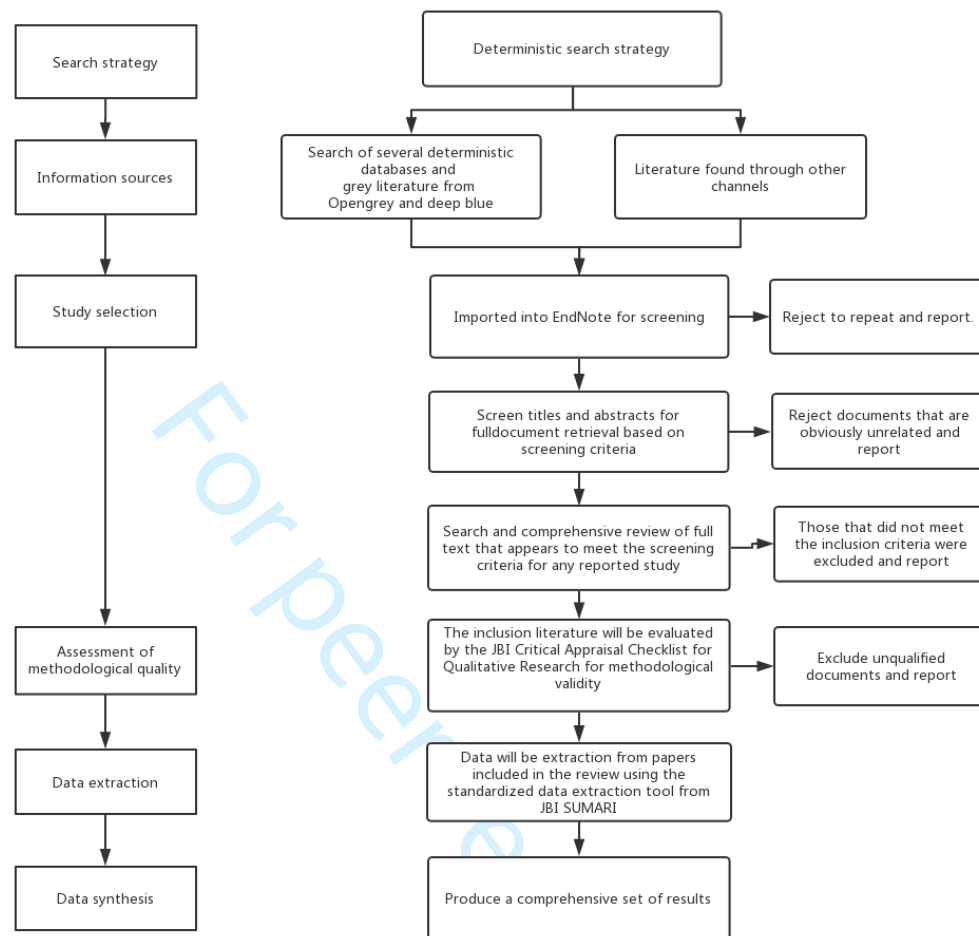


Figure 4: Search and selection process.

Appendix I: Search strategy

PubMed

#1 Diabetes, Gestational [mh] OR Diabetes, Pregnancy-Induced [tiab] OR Diabetes, Pregnancy Induced [tiab] OR Pregnancy-Induced Diabetes [tiab] OR Gestational Diabetes [tiab] OR Diabetes Mellitus, Gestational [tiab] OR Gestational Diabetes Mellitus [tiab] OR GDM [tiab] OR pregnancy diabetes mellitus [tiab]

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#4 #1 AND #2 AND #3

CINAHL Complete (EBSCO)

SU (Diabetes, Gestational OR Diabetes, Pregnancy-Induced OR Diabetes, Pregnancy Induced OR Pregnancy-Induced Diabetes OR Gestational Diabetes OR Diabetes Mellitus, Gestational OR Gestational Diabetes Mellitus OR GDM OR pregnancy diabetes mellitus) AND SU (nursing methodology research OR research, nursing methodology OR methodology research, nursing OR nursing methodological issues research OR clinical methodology research, nursing OR organizational case studies OR health services research OR case stud*, organizational OR studies, organizational case OR management case studies OR case studies, management OR studies, management case OR constant comparative method OR constant comparison OR content analysis OR descriptive Research OR discourse analysis OR ethnography OR exploratory OR feminist OR feminism OR focus group* OR grounded theory OR hermeneutic* OR interview OR narrative OR naturalistic OR naturalistic inquiry OR participant observation OR phenomenology OR qualitative method OR qualitative research OR qualitative stud* OR thematic analysis) AND SU (life change events OR event*, life change OR life change event OR life experience* OR experience*, life OR analysis, event history OR analyses, event history OR event history analyses OR event history analysis OR personal experience)

Embase

#1 'diabetes, gestational':ti,ab,kw OR 'diabetes, pregnancy-induced':ti,ab,kw OR 'diabetes, pregnancy induced':ti,ab,kw OR 'pregnancy-induced diabetes':ti,ab,kw OR 'gestational

diabetes':ti,ab,kw OR 'diabetes mellitus, gestational':ti,ab,kw OR 'gestational diabetes mellitus':ti,ab,kw OR gdm:ti,ab,kw OR 'pregnancy diabetes mellitus':ti,ab,kw

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#3 'life change events':ti,ab,kw OR 'event*', life change':ti,ab,kw OR 'life change event':ti,ab,kw OR 'life experience*':ti,ab,kw OR 'experience*', life':ti,ab,kw OR 'analysis, event history':ti,ab,kw OR 'analyses, event history':ti,ab,kw OR 'event history analyses':ti,ab,kw OR 'event history analysis':ti,ab,kw OR 'personal experience':ti,ab,kw

#4 #1 AND #2 AND #3

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China Biology Medicine disc

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organizational case studies OR health services research OR case stud*, organizational OR studies, organizational case OR management case studies OR case studies, management OR studies, management case OR constant comparative method OR constant comparison OR content analysis OR descriptive Research OR discourse analysis OR ethnography OR exploratory OR feminist OR feminism OR focus group* OR grounded theory OR hermeneutic* OR interview OR narrative OR naturalistic OR naturalistic inquiry OR participant observation OR phenomenology OR qualitative method OR qualitative research OR qualitative stud* OR thematic analysis) AND (life change events OR event*, life change OR life change event OR life experience* OR experience*, life OR analysis, event history OR analyses, event history OR event history analyses OR event history analysis OR personal experience))

China National Knowledge Infrastructure

Subject: ((Diabetes, Gestational OR Diabetes, Pregnancy-Induced OR Diabetes, Pregnancy Induced OR Pregnancy-Induced Diabetes OR Gestational Diabetes OR Diabetes Mellitus, Gestational OR Gestational Diabetes Mellitus OR GDM OR pregnancy diabetes mellitus) AND (nursing methodology research OR research, nursing methodology OR methodology research, nursing OR nursing methodological issues research OR clinical methodology research, nursing OR organizational case studies OR health services research OR case stud*, organizational OR studies, organizational case OR management case studies OR case studies, management OR studies, management case OR constant comparative method OR constant comparison OR content analysis OR descriptive Research OR discourse analysis OR ethnography OR exploratory OR feminist OR feminism OR focus group* OR grounded theory OR hermeneutic* OR interview OR narrative OR naturalistic OR naturalistic inquiry OR participant observation OR phenomenology OR qualitative method OR qualitative research OR qualitative stud* OR thematic analysis) AND (life change events OR event*, life change OR life change event OR life experience* OR experience*, life OR analysis, event history OR analyses, event history OR event history analyses OR event history analysis OR personal experience))

VIP Database for Chinese Technical Periodicals

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The Cochrane Library:

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ISI Web of Science

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JBIR Database of Systematic Reviews

Abstract: Diabetes, Gestational OR Diabetes, Pregnancy Induced OR Diabetes, Pregnancy Induced OR Pregnancy Induced Diabetes OR Gestational Diabetes OR Diabetes Mellitus, Gestational OR Gestational Diabetes Mellitus OR GDM OR pregnancy diabetes mellitus; nursing methodology research OR research, nursing methodology OR methodology research, nursing OR nursing methodological issues research OR clinical methodology research, nursing OR organizational case studies OR health services research OR case stud*, organizational OR studies, organizational case OR management case studies OR case studies, management OR studies, management case OR

constant comparative method OR constant comparison OR content analysis OR descriptive Research OR discourse analysis OR ethnography OR exploratory OR feminist OR feminism OR focus group* OR grounded theory OR hermeneutic* OR interview OR narrative OR naturalistic OR naturalistic inquiry OR participant observation OR phenomenology OR qualitative method OR qualitative research OR qualitative stud* OR thematic analysis; life change events OR event*, life change OR life change event OR life experience* OR experience*, life OR analysis, event history OR analyses, event history OR event history analyses OR event history analysis OR personal experience

OpenGrey

("Diabetes, Gestational" OR "Diabetes, Pregnancy-Induced" OR "Diabetes, Pregnancy Induced" OR "Pregnancy-Induced Diabetes" OR "Gestational Diabetes" OR "Diabetes Mellitus, Gestational" OR "Gestational Diabetes Mellitus" OR "GDM" OR "pregnancy diabetes mellitus") AND ("nursing methodology research" OR "research, nursing methodology" OR "methodology research, nursing" OR "nursing methodological issues research" OR "clinical methodology research, nursing" OR "organizational case studies" OR "health services research" OR "case stud*, organizational" OR "studies, organizational case" OR "management case studies" OR "case studies, management" OR "studies, management case" OR "constant comparative method" OR "constant comparison" OR "content analysis" OR "descriptive Research" OR "discourse analysis" OR "ethnography" OR "exploratory" OR "feminist" OR "feminism" OR "focus group*" OR "grounded theory" OR "hermeneutic*" OR "interview" OR "narrative" OR "naturalistic" OR "naturalistic inquiry" OR "participant observation" OR "phenomenology" OR "qualitative method" OR "qualitative research" OR "qualitative stud*" OR "thematic analysis") AND ("life change events" OR "event*, life change" OR "life change event" OR "life experience*" OR "experience*, life" OR "analysis, event history" OR "analyses, event history" OR "event history analyses" OR "event history analysis" OR "personal experience")

Deep Blue

("Diabetes, Gestational" OR "Diabetes, Pregnancy-Induced" OR "Diabetes, Pregnancy Induced" OR "Pregnancy-Induced Diabetes" OR "Gestational Diabetes" OR "Diabetes Mellitus, Gestational" OR "Gestational Diabetes Mellitus" OR "GDM" OR "pregnancy diabetes mellitus") AND ("nursing methodology research" OR "research, nursing methodology" OR "methodology research, nursing" OR "nursing methodological issues research" OR "clinical methodology research, nursing" OR "organizational case studies" OR "health services research" OR "case stud*, organizational" OR "studies, organizational case" OR "management case studies" OR "case studies, management" OR "studies, management case" OR "constant comparative method" OR "constant comparison" OR "content analysis" OR "descriptive Research" OR "discourse analysis" OR "ethnography" OR "exploratory" OR "feminist" OR "feminism" OR "focus group*" OR "grounded theory" OR "hermeneutic*" OR "interview" OR "narrative" OR "naturalistic" OR "naturalistic inquiry" OR "participant observation" OR "phenomenology" OR "qualitative method" OR "qualitative research" OR "qualitative stud*" OR "thematic analysis") AND ("life change events" OR "event*, life change" OR "life change event" OR "life experience*" OR "experience*, life" OR "analysis, event history" OR "analyses, event history" OR "event history analyses" OR "event history analysis" OR "personal experience")

BMJ Open

The experiences of pregnant women with gestational diabetes mellitus: a systematic review of qualitative evidence protocol

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Primary Subject Heading:	Diabetes and endocrinology
Secondary Subject Heading:	Nursing
Keywords:	lived experience, QUALITATIVE RESEARCH, metasynthesis, Protocols & guidelines < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Diabetes in pregnancy < DIABETES & ENDOCRINOLOGY

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The experiences of pregnant women with gestational diabetes mellitus: a systematic review of qualitative evidence protocol

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[#] Jing He and Yuchen Wang contributed equally to this paper.

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ABSTRACT

Introduction The incidence of gestational diabetes mellitus (GDM) is increasing and an issue of global concern. GDM can cause severe adverse effects for pregnant women and their fetuses. This systematic review is proposed to explore women’s experiences during pregnancy with GDM. This review will provide insights into the physical, psychological, and social adaptation experiences of women with GDM that can help identify challenges of glycemic control and provide targeted care and interventions to improve maternal and child health.

Methods and analysis The databases we will search include English databases (i.e., PubMed, CINAHL, Embase, the Cochrane Library, Web of Science, Joanna Briggs Institute [JBI] Database of Systematic Reviews, PsycINFO, OpenGrey, and Deep Blue) and Chinese databases (i.e., China Biology Medicine disc, China National Knowledge Infrastructure, and VIP Database for Chinese Technical Periodicals). Published qualitative evidence of life changes or experiences of the women with GDM will be searched. There will be no limits on publication year. Two reviewers will independently use the JBI Critical Appraisal Checklist for Qualitative Research for methodological validity prior to inclusion in this review. Any disagreements regarding article evaluation will be resolved through discussion or with a third reviewer. Data will be extracted using the standardized data extraction tool from JBI System for the Unified Management of the Assessment and Review of Information (SUMARI). Synthesis will include in-depth reading of the original text and the discovery of the results, and then summarizing similar categories for more advanced synthesized findings. The final synthesized findings will be graded according to the ConQual approach for establishing confidence.

Ethics and Dissemination This study does not require ethical approval as primary data will not be collected. Results of this systematic review will be submitted to peer-reviewed international journals for publication and be presented in relevant international conferences.

Strengths and limitations of the study

- There is an urgent need to synthesize qualitative evidence about GDM women’s experiences from diagnosis to the end of childbirth so that we can provide insights into GDM management and interventions.
- Results of this review will identify strengths and weaknesses of the current literature regarding GDM women’s experiences.
- Systematic review of qualitative empirical evidence from multiple regions and cultures will facilitate the dissemination of findings regarding GDM and promote nursing practice in GDM.

►This review will not analyze the experiences of postpartum women.

PROSPERO registration number CRD42019132065

INTRODUCTION

Pregnancy is associated with a certain degree of hyperinsulinemia and insulin resistance. For some women, these physiological changes can lead to a high risk of gestational diabetes mellitus (GDM). GDM is a condition in which women without previously diagnosed glucose intolerance exhibit high blood glucose levels during pregnancy, particularly during their third trimester. The blood glucose is usually restored to normal around the time of birth.¹ The incidence of gestational diabetes mellitus (GDM) is increasing and an issue of global concern. According to the latest diagnostic criteria established by the International Association of Diabetes and Pregnancy Study Groups (IADPSG) in 2010, the prevalence of GDM was estimated as 9.8–25.5% worldwide.² The primary risk factors for GDM include maternal age, race/ethnicity, parity, body mass index (BMI), hypertension, and smoking status.³

As there are few or no symptoms, pregnant women are usually not aware of the GDM until it is diagnosed at a routine prenatal screening.⁴ Compared with healthy pregnant women, many serious pregnancy complications are associated with GDM. GDM has serious adverse effects on the health of both the mother and the infant. GDM can directly lead to cesarean section, and many other complications such as hypertension, abortion, and fetal malformation.^{5–6} For the fetus, high risk of complications of GDM include fetal intrauterine growth retardation and macrosomia.⁷ Exposure to GDM pregnancy in utero has been shown to cause long-term negative effects in offspring, such as increased incidence of type 2 diabetes mellitus (T2DM), cardiovascular alterations, hypertension, metabolic syndrome, and obesity.^{8–10} Additionally, exposure to maternal GDM is an independent risk factor for long-term neuropsychiatric morbidity in the offspring.¹¹ Women with GDM have seven-fold increased risk for T2DM compared to normal pregnant women.^{12–13} There are 35–50% of women with GDM may have recurrence in subsequent pregnancies.¹⁴

Due to negative consequences of GDM to pregnant women and infants, intervention programs on GDM treatments have been developed to improve maternal and newborn health outcomes.¹⁵ Current interventions primarily include glucose monitoring dietary, physical activity, pharmacological hypoglycemic agents (oral hypoglycemic agents or insulin), health education, psychological, and selective combine intervention.¹⁶ Many studies have been

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published on the issue of diagnosis, testing, and treatment of GDM. However, the experiences of women diagnosed with GDM during treatment are still not well studied.¹⁷ GDM is associated with lifestyle changes and emotional reactions due to treatment.¹⁸ Information about the diagnosis may be distressing to pregnant women.¹⁹ ²⁰ Pregnant women may receive certain types of health-related guidance from medical institutions after the diagnosis of GDM. However, how they accept and manage the required behavioral changes needs to be further studied.²¹ For instance, many women with GDM perceive family guidance as a responsibility and also lack support from family. An inadequate social and family support can create barriers to behavioral changes and social isolation, and therefore these healthy behavioral changes will be difficult to be maintained.²² ²³

Women who suffer from GDM may have distressing experiences, with the shock of diagnosis followed by self-accusation and anxiety for the unborn baby or motivation to take control of their health during pregnancy such as managing GDM by following detailed lifestyle changes.²⁴ ²⁵ But there are also a large number of women who are not trying to change their behaviors.²⁶ Quantitative studies related to GDM have provided some clinical guidance, such as the need for dietary management to effectively control blood glucose.²⁷ ²⁸ However, there are many challenges in the process of self-management, and it is very difficult for women to maintain a reasonable blood glucose level.²⁹

The purpose of this review is to gain a deeper understanding regarding diagnosis and knowledge of the disease of pregnant women with GDM, pregnant women’s beliefs about health, expectations of pregnancy outcomes and maternal and child’s future health, as well as challenges and needs during pregnancy. This review will provide insights into the physical, psychological, and social adaptation experiences of women with GDM that can help identify challenges of glycemic control and provide targeted care and interventions to improve maternal and child health.

METHODS

This review aims to synthesize experiences of women with GDM during pregnancy. The research question will be appropriately answered by qualitative studies. The initial scope of the literature search provides recommendations for the proposed syntheses. The topic synthesis approach involves the use of topic analysis techniques to identify key concepts or topics in primary studies, then form the title, and complete the title registration in Joanna Briggs Institute (JBI) System and PROSPERO.

Inclusion criteria

Types of participants

This review will search and integrate studies of women with GDM during pregnancy. Searched studies will be eligible regardless of women's age and whether they have pregnancies for the first time or not.

Phenomenon of interest

This review will include studies that describe the experiences of women with GDM during pregnancy.

Context

The context will consider in the experiences and feelings of women with GDM during pregnancy.

Types of studies

The review will consider qualitative studies including, but not limited to, designs such as phenomenology, grounded theory, ethnography, and feminist research.

Patient and public involvement

No patient will be involved.

Search strategy

The search strategy aims to find both published and gray literature. An initial limited search of PubMed will be conducted, following by an analysis of MeSH terms contained in the title and abstract, and of the index terms used to describe the articles. This will inform the development of a search strategy which will be tailored for each database source. A second and complete search using all identified keywords and index entries will take place in all the relevant databases. Thirdly, the reference list of all identified articles will be examined for additional studies relevant to this review. Previously published studies in English and Chinese will be considered for inclusion in the database. A full search strategy has been done (Appendix I).

Information sources

The databases to be searched will include English databases (i.e., PubMed, CINAHL, Embase, the Cochrane Library, Web of Science, Joanna Briggs Institute [JBI] Database of Systematic Reviews and PsycINFO) and Chinese databases (i.e., China Biology Medicine disc, China National Knowledge Infrastructure, and VIP Database for Chinese Technical Periodicals). The search for gray literature will include OpenGrey and Deep Blue.

Study selection

Following the search, all identified studies will be collated and uploaded into EndNote X7 (Clarivate Analytics, PA, USA), with duplicates removed. Two independent reviewers (JH and

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YW) will screen titles and abstracts for assessment against the inclusion criteria of the review. Studies identified as potentially eligible or those without an abstract will have their full text retrieved and their details will be imported into the JBI System for the Unified Management, Assessment and Review of Information (JBI SUMARI).³⁰ Full texts of selected citations will be retrieved and assessed in detail against the inclusion criteria by two independent reviewers (JH and YW). Full texts that do not meet the inclusion criteria will be excluded, and reasons for exclusion will be provided in an appendix in the final systematic review report. Included studies will go through a critical screening process, and any differences between the two reviewers will be resolved through discussion. If no agreement is reached, a third reviewer (XC) will be involved.

Assessment of methodological quality

Qualitative papers selected for inclusion will be assessed by two independent reviewers (JH and YW) according to the 10 items checklist of the JBI Qualitative Assessment and Review Instrument (JBI-QARI) for methodological validity prior to inclusion in the review.³¹ This tool has been found to be more coherent and sensitive to effectiveness assessments than other commonly used tools. The evaluation content includes: methodology and philosophical perspective of the research, the research objectives, the methods used to collect data, analysis of data, the interpretation of results, if have statement for the influence of the researcher on the research, representativeness of the participants and the ethical and so on. All items were evaluated by using ‘yes’, ‘no’ and ‘unclear’ to appraisal. An extract summary of the appraisal items is listed in Figure 1. The 10 items were scored similarly as the quantitative index with less than or equal to 6 points representing a weak rating, 7 to 8 points representing a moderate rating, and 9 to 10 points representing a strong rating. References of the moderate rating or above will be included. Any disagreements that arise between the reviewers will be resolved through discussion or with a third reviewer (XC). Studies of the moderate rating or above will be included, extracted, synthesized from the data, and reflected in the results and conclusions of this system review. Low quality literature will be reported.

Data extraction

Data will be extracted from papers independently by two reviewers (JH and YW) using the standardized data extraction tool from JBI SUMARI. The extracted data will include specific details (Figure 2) about the study groups, context, culture, geographical location, study methods, the phenomena of interest relevant to the review question (i.e., experiences of women with gestational diabetes during pregnancy in mental, physical, and family life), and detail research objectives. Findings and their illustrations will be extracted and assigned a level of

credibility.

Data synthesis

Qualitative research findings will be aggregated using JBI SUMARI with the meta-aggregation approach. There are three steps to integrate findings of the original study. First, individual findings will be appraised and will achieve one of three outcomes: unequivocal (evidence beyond reasonable doubt); credible (contains illustrations that may be challenged); or unsupported (when findings are not supported). Second, findings of all included studies will be extracted and categorized to create a set of categories representing meaningful similarities. Third, these similar categories are subjected to a synthesis in order to obtain a single comprehensive set of synthesized findings, which can be used as a foundation for evidence-based practice. For example, findings included “husband’s support” and “mother in-law’s support” that can be summarized as a category of “family support”. The finding about “support of nurses and midwives” will be summarized as a category for “professional support”. Then, the two categories are subjected to create a set of synthetic results called “social support”. If textual pooling is not possible, findings will be presented in a narrative form. Coding of findings, in time of the aggregation process to explore the influence, will be considered, about experiences of women with GDM during pregnancy. Two review authors will independently cluster identified findings, compare the generated categories, and discuss discrepancies until reaching agreement. Finally, two authors of this study will work together to create a comprehensive set of synthesized findings.

Assessing certainty in the finding

The final findings will be graded according to the ConQual approach for establishing confidence in the output of research synthesis and presented in a summary of findings.³² The ConQual process was used to analyze the level of confidence or trust that exists in the value and level of evidence of each synthesized finding (Figure3). The figure will include the major elements of this systematic review and details on how the ConQual score is developed. The summary of findings will include the primary study title, phenomena of interest, and context for the special review. The flowchart (Figure 4) shows the whole protocol process, which was completed by two independently reviewers, and then combined with our analysis.

PRESENTING AND REPORTING THE REVIEW

The resulting review will be reported in accordance with the ‘Enhancing Transparency in Reporting the Synthesis of Qualitative Research’ (ENTREQ) statement³³, which consists of 21 items and is appropriate for qualitative evidence synthesis (Table 1).

Table 1 Summary of the Enhancing Transparency in Reporting the Synthesis of Qualitative Research statement	
No	Item
1	Aim
2	Synthesis methodology
3	Approach to searching
4	Inclusion criteria
5	Data sources
6	Electronic Search strategy
7	Study screening methods
8	Study characteristics
9	Study selection results
10	Rationale for appraisal
11	Appraisal items
12	Appraisal process
13	Appraisal results
14	Data extraction
15	Software
16	Number of reviewers
17	Coding
18	Study comparison
19	Derivation of themes
20	Quotations
21	Synthesis output

DISCUSSION

This systematic review will discover women's experiences after being diagnosed with GDM during pregnancy and integrate these findings for a comprehensive and in-depth understanding of their difficulties and needs. Specific personal experiences of women with GDM can inform professional healthcare and provide personalized care and education for these women. Improved care will promote maternal and child health, and therefore reduce the medical burden.

This systematic review of qualitative evidence will be published in an open access, peer reviewed, and international journal for dissemination.

Acknowledgments We thank the librarian (Jin Chen) from Wuhan University for his guidance and assistance in retrieving the bibliographic database.

Contributors JH and YW contributed to the conception of the study. The manuscript protocol was drafted and finished the introduction by JH and YW. JH, YW and XC drafted and finished the Methods sections with assistance from YL. And the protocol was revised by JB. All the authors developed the search strategy and JH and YW will also independently screen the potential studies, extract data from the included studies, assess the risk of bias and complete the data synthesis. XC will arbitrate in cases of disagreement and ensure the absence of errors. All authors approved the publication of the protocol.

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Conflict of interests

The authors declare that we have no conflict of interests.

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Figure 1: Joanna Briggs Institute quality appraisal tool

Figure 2: Data extraction tool to include all the results and findings sections of each included study

Figure 3: ConQual Summary of Findings

Figure 4: Search and selection process

Appendix I: Search strategy

For peer review only

Summary JBI Qualitative Assessment and Review Instrument (QARI)													
Record details/ Full reference	Is there congruity between the stated philosophical perspective and the research question or methodology?	Is there congruity between the research methodology and the research question or objectives?	Is there congruity between the research methodology and the methods used to collect data?	Is there congruity between the research methodology and the representation and analysis of data?	Is there congruity between the research methodology and the interpretation of results?	Is there a statement locating the researcher culturally or theoretically?	Is the influence of the researcher on the research, and vice-versa, addressed?	Are participants and their voices, adequately represented?	Is the research ethical according to current criteria or, is there evidence of ethical approval by an appropriate body?	Do the conclusions drawn in the research report flow from the analysis, or interpretation of the data?	Score	seek further into	Comments (including reason for exclusion)
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	/10		

Figure 1: Joanna Briggs Institute quality appraisal tool

Modified JBI data extraction form for FGM Systematic Review										
Study (Name and Authors)	Phenomenon a of interest	Methodology	Methods	Setting	Geographical	Cultural	Participants (Age, relevant number, sample)	Data analysis	Authors Conclusion	Comments

Figure 2: Data extraction tool to include all the results and findings sections of each included study

Systematic review title: the experiences of the pregnant with gestational diabetes: a systematic review of qualitative evidence				
Population: persons who have been diagnosed with GDN during pregnancy				
Phenomena of interest: the exposition of the experiences of women with GDM during pregnancy				
Context: in the experiences and feelings of women with GDM during pregnancy				
Synthesized finding	Type of research	Dependability	Credibility	ConQual score

Figure 3: ConQual Summary of Findings

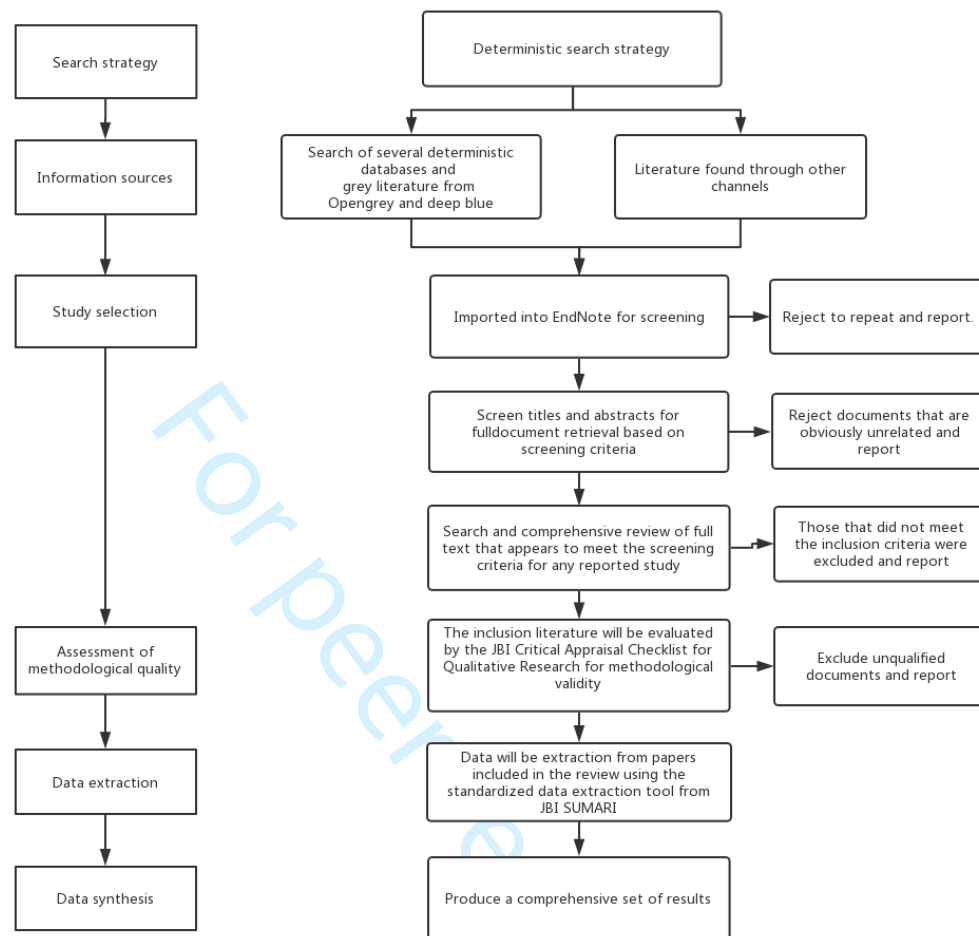


Figure 4: Search and selection process

Appendix I: Search strategy

PubMed

#1 Diabetes, Gestational [mh] OR Diabetes, Pregnancy-Induced [tiab] OR Diabetes, Pregnancy Induced [tiab] OR Pregnancy-Induced Diabetes [tiab] OR Gestational Diabetes [tiab] OR Diabetes Mellitus, Gestational [tiab] OR Gestational Diabetes Mellitus [tiab] OR GDM [tiab] OR pregnancy diabetes mellitus [tiab]

#2 nursing methodology research [mh] OR research, nursing methodology [tiab] OR methodology research, nursing [tiab] OR nursing methodological issues research [tiab] OR clinical methodology research, nursing [tiab] OR organizational case studies [tiab] OR health services research [tiab] OR case stud*, organizational [tiab] OR studies, organizational case [tiab] OR management case studies [tiab] OR case studies, management [tiab] OR studies, management case [tiab] OR constant comparative method [tiab] OR constant comparison [tiab] OR content analysis [tiab] OR descriptive Research [tiab] OR discourse analysis [tiab] OR ethnography [tiab] OR exploratory [tiab] OR feminist [tiab] OR feminism [tiab] OR focus group* [tiab] OR grounded theory [tiab] OR hermeneutic* [tiab] OR interview [tiab] OR narrative [tiab] OR naturalistic [tiab] OR naturalistic inquiry [tiab] OR participant observation [tiab] OR phenomenology [tiab] OR qualitative method [tiab] OR qualitative research [tiab] OR qualitative stud* [tiab] OR thematic analysis [tiab]

#3 life change events [mh] OR event*, life change [tiab] OR life change event [tiab] OR life experience* [tiab] OR experience*, life [tiab] OR analysis, event history [tiab] OR analyses, event history [tiab] OR event history analyses [tiab] OR event history analysis [tiab] OR personal experience [tiab]

#4 #1 AND #2 AND #3

CINAHL Complete (EBSCO)

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diabetes':ti,ab,kw OR 'diabetes mellitus, gestational':ti,ab,kw OR 'gestational diabetes mellitus':ti,ab,kw OR gdm:ti,ab,kw OR 'pregnancy diabetes mellitus':ti,ab,kw

#2 'nursing methodology research':ti,ab,kw OR 'research, nursing methodology':ti,ab,kw OR 'methodology research, nursing':ti,ab,kw OR 'nursing methodological issues research':ti,ab,kw OR 'clinical methodology research, nursing':ti,ab,kw OR 'organizational case studies':ti,ab,kw OR 'health services research':ti,ab,kw OR 'case stud*', organizational':ti,ab,kw OR 'studies, organizational case':ti,ab,kw OR 'management case studies':ti,ab,kw OR 'case studies, management':ti,ab,kw OR 'studies, management case':ti,ab,kw OR 'constant comparative method':ti,ab,kw OR 'constant comparison':ti,ab,kw OR 'content analysis':ti,ab,kw OR 'descriptive research':ti,ab,kw OR 'discourse analysis':ti,ab,kw OR ethnography:ti,ab,kw OR exploratory:ti,ab,kw OR feminist:ti,ab,kw OR feminism:ti,ab,kw OR 'focus group*':ti,ab,kw OR 'grounded theory':ti,ab,kw OR hermeneutic*:ti,ab,kw OR interview:ti,ab,kw OR narrative:ti,ab,kw OR naturalistic:ti,ab,kw OR 'naturalistic inquiry':ti,ab,kw OR 'participant observation':ti,ab,kw OR phenomenology:ti,ab,kw OR 'qualitative method':ti,ab,kw OR 'qualitative research':ti,ab,kw OR 'qualitative stud*':ti,ab,kw OR 'thematic analysis':ti,ab,kw

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#4 #1 AND #2 AND #3

PsycINFO

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China Biology Medicine disc

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organizational case studies OR health services research OR case stud*, organizational OR studies, organizational case OR management case studies OR case studies, management OR studies, management case OR constant comparative method OR constant comparison OR content analysis OR descriptive Research OR discourse analysis OR ethnography OR exploratory OR feminist OR feminism OR focus group* OR grounded theory OR hermeneutic* OR interview OR narrative OR naturalistic OR naturalistic inquiry OR participant observation OR phenomenology OR qualitative method OR qualitative research OR qualitative stud* OR thematic analysis) AND (life change events OR event*, life change OR life change event OR life experience* OR experience*, life OR analysis, event history OR analyses, event history OR event history analyses OR event history analysis OR personal experience))

China National Knowledge Infrastructure

Subject: ((Diabetes, Gestational OR Diabetes, Pregnancy-Induced OR Diabetes, Pregnancy Induced OR Pregnancy-Induced Diabetes OR Gestational Diabetes OR Diabetes Mellitus, Gestational OR Gestational Diabetes Mellitus OR GDM OR pregnancy diabetes mellitus) AND (nursing methodology research OR research, nursing methodology OR methodology research, nursing OR nursing methodological issues research OR clinical methodology research, nursing OR organizational case studies OR health services research OR case stud*, organizational OR studies, organizational case OR management case studies OR case studies, management OR studies, management case OR constant comparative method OR constant comparison OR content analysis OR descriptive Research OR discourse analysis OR ethnography OR exploratory OR feminist OR feminism OR focus group* OR grounded theory OR hermeneutic* OR interview OR narrative OR naturalistic OR naturalistic inquiry OR participant observation OR phenomenology OR qualitative method OR qualitative research OR qualitative stud* OR thematic analysis) AND (life change events OR event*, life change OR life change event OR life experience* OR experience*, life OR analysis, event history OR analyses, event history OR event history analyses OR event history analysis OR personal experience))

VIP Database for Chinese Technical Periodicals

Title and abstract= Diabetes, Gestational OR Diabetes, Pregnancy-Induced OR Diabetes, Pregnancy Induced OR Pregnancy-Induced Diabetes OR Gestational Diabetes OR Diabetes Mellitus, Gestational OR Gestational Diabetes Mellitus OR GDM OR pregnancy diabetes mellitus AND title and abstract= AND nursing methodology research OR research, nursing methodology OR methodology research, nursing OR nursing methodological issues research OR clinical methodology research, nursing OR organizational case studies OR health services research OR case stud*, organizational OR studies, organizational case OR management case studies OR case studies, management OR studies, management case OR constant comparative method OR constant comparison OR content analysis OR descriptive Research OR discourse analysis OR ethnography OR exploratory OR feminist OR feminism OR focus group* OR grounded theory OR hermeneutic* OR interview OR narrative OR naturalistic OR naturalistic inquiry OR participant observation OR phenomenology OR qualitative method OR qualitative research OR qualitative stud* OR thematic analysis title and abstract= life change events OR event*, life change OR life change event OR life experience* OR experience*, life OR analysis, event history OR analyses, event history OR event history analyses OR event history analysis OR personal experience

The Cochrane Library:

#1 (Diabetes, Gestational OR Diabetes, Pregnancy-Induced OR Diabetes, Pregnancy Induced OR Pregnancy-Induced Diabetes OR Gestational Diabetes OR Diabetes Mellitus, Gestational OR Gestational Diabetes Mellitus OR GDM OR pregnancy diabetes mellitus):ti,ab,kw

#2 (nursing methodology research OR research, nursing methodology OR methodology research, nursing OR nursing methodological issues research OR clinical methodology research, nursing OR organizational case studies OR health services research OR case stud*, organizational OR studies, organizational case OR management case studies OR case studies, management OR studies, management case OR constant comparative method OR constant comparison OR content analysis OR descriptive Research OR discourse analysis OR ethnography OR exploratory OR feminist OR feminism OR focus group* OR grounded theory OR hermeneutic* OR interview OR narrative OR naturalistic OR naturalistic inquiry OR participant observation OR phenomenology OR qualitative method OR qualitative research OR qualitative stud* OR thematic analysis) :ti,ab,kw

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ISI Web of Science

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JBIR Database of Systematic Reviews

Abstract: Diabetes, Gestational OR Diabetes, Pregnancy Induced OR Diabetes, Pregnancy Induced OR Pregnancy Induced Diabetes OR Gestational Diabetes OR Diabetes Mellitus, Gestational OR Gestational Diabetes Mellitus OR GDM OR pregnancy diabetes mellitus; nursing methodology research OR research, nursing methodology OR methodology research, nursing OR nursing methodological issues research OR clinical methodology research, nursing OR organizational case studies OR health services research OR case stud*, organizational OR studies, organizational case OR management case studies OR case studies, management OR studies, management case OR

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OpenGrey

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BMJ Open

The experiences of pregnant women with gestational diabetes mellitus: a systematic review of qualitative evidence protocol

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Primary Subject Heading:	Diabetes and endocrinology
Secondary Subject Heading:	Nursing
Keywords:	lived experience, QUALITATIVE RESEARCH, metasynthesis, Protocols & guidelines < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, Diabetes in pregnancy < DIABETES & ENDOCRINOLOGY

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The experiences of pregnant women with gestational diabetes mellitus: a systematic review of qualitative evidence protocol

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[#] Jing He and Yuchen Wang contributed equally to this paper.

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ABSTRACT

Introduction The incidence of gestational diabetes mellitus (GDM) is increasing and an issue of global concern. GDM can cause severe adverse effects for pregnant women and their fetuses. This systematic review is proposed to explore women’s experiences during pregnancy with GDM. This review will provide insights into the physical, psychological, and social adaptation experiences of women with GDM that can help identify challenges of glycemic control and provide targeted care and interventions to improve maternal and child health.

Methods and analysis The databases we will search include English databases (i.e., PubMed, CINAHL, Embase, the Cochrane Library, Web of Science, Joanna Briggs Institute [JBI] Database of Systematic Reviews, PsycINFO, OpenGrey, and Deep Blue) and Chinese databases (i.e., China Biology Medicine disc, China National Knowledge Infrastructure, and VIP Database for Chinese Technical Periodicals). Published qualitative evidence of life changes or experiences of the women with GDM will be searched. There will be no limits on publication year. Two reviewers will independently use the JBI Critical Appraisal Checklist for Qualitative Research for methodological validity prior to inclusion in this review. Any disagreements regarding article evaluation will be resolved through discussion or with a third reviewer. Data will be extracted using the standardized data extraction tool from JBI System for the Unified Management of the Assessment and Review of Information (SUMARI). Synthesis will include in-depth reading of the original text and the discovery of the results, and then summarizing similar categories for more advanced synthesized findings. The final synthesized findings will be graded according to the ConQual approach for establishing confidence.

Ethics and Dissemination This study does not require ethical approval as primary data will not be collected. Results of this systematic review will be submitted to peer-reviewed international journals for publication and be presented in relevant international conferences.

Strengths and limitations of the study

- There is an urgent need to synthesize qualitative evidence about GDM women’s experiences from diagnosis to the end of childbirth so that we can provide insights into GDM management and interventions.
- Results of this review will identify strengths and weaknesses of the current literature regarding GDM women’s experiences.
- Systematic review of qualitative empirical evidence from multiple regions and cultures will facilitate the dissemination of findings regarding GDM and promote nursing practice in GDM.

►This review will not analyze the experiences of postpartum women.

PROSPERO registration number CRD42019132065

INTRODUCTION

During pregnancy, the body is resistant to insulin in response to physiological changes which may lead to a high risk of gestational diabetes mellitus (GDM) for some pregnant women.¹ GDM is defined as the first abnormal glucose metabolism during pregnancy.² Prevalence of GDM is influenced by screening methods, diagnostic criteria, and the inherent characteristics in every study population, making it difficult to estimate global prevalence, but the prevalence of GDM poses significant challenges to global public health.³ Using IADPSG diagnostic criteria, the study found that the incidence of GDM fluctuated between 5.12% and 33.3% in mainland China.⁴ The primary risk factors for GDM include maternal age, race/ethnicity, parity, body mass index (BMI), hypertension, and smoking status.⁵

As there are few or no symptoms, pregnant women are usually not aware of the GDM until it is diagnosed at a routine prenatal screening.⁶ Compared with healthy pregnant women, many serious pregnancy complications are associated with GDM. GDM has serious adverse effects on the health of both the mother and the infant. GDM can directly lead to cesarean section, and many other complications such as hypertension, abortion, and fetal malformation.^{7 8} For the fetus, high risk of complications of GDM include fetal intrauterine growth retardation and macrosomia.⁹ Further more, studies also showed that GDM had long-term negative effects in offspring, such as high risk of type 2 diabetes mellitus (T2DM), obesity, and cardiovascular diseases.¹⁰⁻¹³ Additionally, exposure to maternal GDM is an independent risk factor for long-term neuropsychiatric morbidity in the offspring.¹⁴ Women with GDM have seven-fold increased risk for T2DM compared to normal pregnant women.^{15 16} There are 35-50% of women with GDM may have recurrence in subsequent pregnancies.¹⁷

Due to negative consequences of GDM to pregnant women and infants, intervention programs on GDM treatments have been developed to improve maternal and newborn health outcomes.¹⁸ Current interventions primarily include glucose monitoring dietary, physical activity, pharmacological hypoglycemic agents (oral hypoglycemic agents or insulin), health education, psychological, and selective combine intervention.¹⁹ Many studies have been published on the issue of diagnosis, testing, and treatment of GDM. However, the experiences of women diagnosed with GDM during treatment are still not well studied.²⁰ GDM is associated

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with lifestyle changes and emotional reactions due to treatment.²¹ Information about the diagnosis may be distressing to pregnant women.^{22 23} Pregnant women may receive certain types of health-related guidance from medical institutions after the diagnosis of GDM. However, how they accept and manage the required behavioral changes needs to be further studied.²⁴ For instance, many women with GDM perceive family guidance as a responsibility and also lack support from family. An inadequate social and family support can create barriers to behavioral changes and social isolation, and therefore these healthy behavioral changes will be difficult to be maintained.^{25 26}

Women who suffer from GDM may have distressing experiences such as self-accusation and anxiety for the new baby. Besides, women may change their lifestyles to manage pregnant blood glucose.²⁷⁻²⁹ But there are also a large number of women who are not trying to change their behaviors.³⁰ Quantitative studies related to GDM have provided some clinical guidance, such as the need for dietary management to effectively control blood glucose.^{31 32} However, there are many challenges in the process of self-management, and it is very difficult for women to maintain a reasonable blood glucose level.³³

The purpose of this review is to gain a deeper understanding regarding diagnosis and knowledge of the disease of pregnant women with GDM, pregnant women’s beliefs about health, expectations of pregnancy outcomes and maternal and child’s future health, as well as challenges and needs during pregnancy. This review will provide insights into the physical, psychological, and social adaptation experiences of women with GDM that can help identify challenges of glycemic control and provide targeted care and interventions to improve maternal and child health.

METHODS

This review aims to synthesize experiences of women with GDM during pregnancy. The research question will be appropriately answered by qualitative studies. The initial scope of the literature search provides recommendations for the proposed syntheses. The topic synthesis approach involves the use of topic analysis techniques to identify key concepts or topics in primary studies, then form the title, and complete the title registration in Joanna Briggs Institute (JBI) System and PROSPERO.

Inclusion criteria

Types of participants

This review will search and integrate studies of women with GDM during pregnancy. Searched studies will be eligible regardless of women’s age and whether they have pregnancies for the

first time or not.

Phenomenon of interest

This review will include studies that describe the experiences of women with GDM during pregnancy.

Context

The context will consider in the experiences and feelings of women with GDM during pregnancy.

Types of studies

The review will consider qualitative studies including, but not limited to, designs such as phenomenology, grounded theory, ethnography, and feminist research.

Patient and public involvement

No patient will be involved in the design, planning and conception of this study.

Search strategy

The search strategy aims to find both published and gray literature. An initial limited search of PubMed will be conducted, following by an analysis of MeSH terms contained in the title and abstract, as well as the index terms used to describe the articles. This will inform the development of a search strategy which will be tailored for each database source. A second and complete search using all identified keywords and index entries will take place in all the relevant databases. Thirdly, the reference list of all identified original studies will be examined for additional studies that may be relevant to this review. Previously published studies in English and Chinese will be considered for inclusion in the database. A full search strategy has been done (Appendix I).

Information sources

the Cochrane Library, Web of Science, Joanna Briggs Institute [JBI] Database of Systematic Reviews and PsycINFO) and Chinese databases (i.e., China Biology Medicine disc, China National Knowledge Infrastructure, and VIP Database for Chinese Technical Periodicals). The search for gray literature will include OpenGrey and Deep Blue.

Study selection

All searched studies will be collated and uploaded into our software of EndNote X9. The duplicated studies will be removed.³⁴ Two independent reviewers (JH and YW) will screen the title and abstract of the article based on the reviewer's inclusion criteria. Studies identified as potentially eligible or those without an abstract will have their full text retrieved and their details will be imported into the JBI System for the Unified Management, Assessment and

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Review of Information (JBI SUMARI).³⁵ The two independent reviewers (JH and YW) will retrieve and evaluate full texts of selected citations in detail which meet the inclusion criteria. Full texts that do not meet our inclusion criteria will be excluded, and excluding reasons will be attached as an appendix in the final systematic review report.³⁴ Included studies will go through a critical screening process, and any differences between the two reviewers will be resolved through discussion. If no agreement is reached, a third reviewer (XC) will be involved.

Assessment of methodological quality

Qualitative papers selected for inclusion will be assessed by two independent reviewers (JH and YW) according to the 10 items checklist of the JBI Qualitative Assessment and Review Instrument (JBI-QARI) for methodological validity prior to inclusion in the review.³⁶ This tool has been found to be more coherent and sensitive to effectiveness assessments than other commonly used tools. The evaluation content includes: methodology and philosophical perspective of the research, the research objectives, the methods used to collect data, analysis of data, the interpretation of results, if have statement for the influence of the researcher on the research, representativeness of the participants and the ethical and so on. All items were evaluated by using ‘yes’, ‘no’ and ‘unclear’ to appraisal. An extract summary of the appraisal items is listed in Figure 1. The scores for these 10 items are similar to quantitative measures, with a score below or equal to 6 for a weak rating, 7 to 8 for a medium rating and 9 to 10 for a strong rating. References of the moderate rating or above will be included. Any disagreements that arise between the reviewers will be resolved through discussion by agreement or with a third reviewer (XC). Studies of the moderate rating or above will be included, extracted, synthesized from the data, and reflected in the results and conclusions of this system review. Low quality literature will be reported.

Data extraction

Two reviewers (JH and YW) will independently extract data from papers by using the standardized data extraction tool from JBI SUMARI. The extracted data will include specific details (Figure 2) about the study groups, context, culture, geographical location, study methods, the phenomena of interest relevant to the review question (i.e., experiences of women with gestational diabetes during pregnancy in mental, physical, and family life), and detail research objectives. Findings and their illustrations will be extracted and assigned a level of credibility.

Data synthesis

Qualitative research findings will be aggregated using JBI SUMARI with the meta-aggregation approach. There are three steps to integrate findings of the original study. First, individual

findings will be appraised and will achieve one of three outcomes: unequivocal (evidence beyond reasonable doubt); credible (contains illustrations that may be challenged); or unsupported (when findings are not supported). Second, findings of all included studies will be extracted and categorized to create a set of categories representing meaningful similarities. Third, these similar categories are subjected to a synthesis in order to obtain a single comprehensive set of synthesized findings, which can be used as a foundation for evidence-based practice. For example, findings included “husband’s support” and “mother in-law’s support” that can be summarized as a category of “family support”. The finding about “support of nurses and midwives” will be summarized as a category for “professional support”. Then, the two categories are subjected to create a set of synthetic results called “social support”. If textual pooling is not possible, findings will be presented in a narrative form. Coding of findings, in time of the aggregation process to explore the influence, will be considered, about experiences of women with GDM during pregnancy. Two review authors will independently cluster identified findings, compare the generated categories, and discuss discrepancies until reaching agreement. Finally, two authors of this study will work together to create a comprehensive set of synthesized findings.

Assessing certainty in the finding

The final findings will be graded according to the ConQual approach for establishing confidence in the output of research synthesis and presented in a summary of findings.³⁷ The ConQual process was used to analyze the level of confidence or trust that exists in the value and level of evidence of each synthesized finding (Figure3). The figure will include the major elements of this systematic review and details on how the ConQual score is developed. The summary of findings will include the primary study title, phenomena of interest, and context for the special review. The flowchart (Figure 4) shows the whole protocol process, which will be completed by two reviewers independently, and then combined with our analysis.

PRESENTING AND REPORTING THE REVIEW

The resulting review will be reported in accordance with the ‘Enhancing Transparency in Reporting the Synthesis of Qualitative Research’ (ENTREQ) statement³⁸, which consists of 21 items and is appropriate for qualitative evidence synthesis (Table 1).

Table 1 Summary of the Enhancing Transparency in Reporting the Synthesis of Qualitative Research statement

No	Item
1	Aim
2	Synthesis methodology
3	Approach to searching
4	Inclusion criteria
5	Data sources
6	Electronic Search strategy
7	Study screening methods
8	Study characteristics
9	Study selection results
10	Rationale for appraisal
11	Appraisal items
12	Appraisal process
13	Appraisal results
14	Data extraction
15	Software
16	Number of reviewers
17	Coding
18	Study comparison
19	Derivation of themes
20	Quotations
21	Synthesis output

DISCUSSION

This systematic review will discover women's experiences after being diagnosed with GDM during pregnancy and integrate these findings for a comprehensive and in-depth understanding of their difficulties and needs. Specific personal experiences of women with GDM can inform professional healthcare and provide personalized care and education for these women. Improved care will promote maternal and child health, and therefore reduce the medical burden.

This systematic review of qualitative evidence will be published in an open access, peer reviewed, and international journal for dissemination.

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Contributors JH and YW contributed to the conception of the study. The manuscript protocol was drafted and finished the introduction by JH and YW. JH, YW and XC drafted and finished the Methods sections with assistance from YL. And the protocol was revised by JB. All the

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3 authors developed the search strategy and JH and YW will also independently screen the
4 potential studies, extract data from the included studies, assess the risk of bias and complete
5 the data synthesis. XC will arbitrate in cases of disagreement and ensure the absence of errors.
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7 All authors approved the publication of the protocol.
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10 11 12 **Funding**

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14 and Social Sciences [grant number 17YJCZH113, 2017];
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17 18 19 **Conflict of interests**

20 The authors declare that we have no conflict of interests.
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Figure 1: Joanna Briggs Institute quality appraisal tool

Figure 2: Data extraction tool to include all the results and findings sections of each included study

Figure 3: ConQual Summary of Findings

Figure 4: Search and selection process

Appendix I: Search strategy

For peer review only

Summary JBI Qualitative Assessment and Review Instrument (QARI)													
Record details/ Full reference	Is there congruity between the stated philosophical perspective and the research question or methodology?	Is there congruity between the research methodology and the research question or objectives?	Is there congruity between the research methodology and the methods used to collect data?	Is there congruity between the research methodology and the representation and analysis of data?	Is there congruity between the research methodology and the interpretation of results?	Is there a statement locating the researcher culturally or theoretically?	Is the influence of the researcher on the research, and vice-versa, addressed?	Are participants and their voices, adequately represented?	Is the research ethical according to current criteria or, is there evidence of ethical approval by an appropriate body?	Do the conclusions drawn in the research report flow from the analysis, or interpretation of the data?	Score	seek further into	Comments (including reason for exclusion)
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	/10		

Figure 1: Joanna Briggs Institute quality appraisal tool

Modified JBI data extraction form for FGM Systematic Review										
Study (Name and Authors)	Phenomenon a of interest	Methodology	Methods	Setting	Geographical	Cultural	Participants (Age, relevant number, sample)	Data analysis	Authors Conclusion	Comments

Figure 2: Data extraction tool to include all the results and findings sections of each included study

Systematic review title: the experiences of the pregnant with gestational diabetes: a systematic review of qualitative evidence				
Population: persons who have been diagnosed with GDN during pregnancy				
Phenomena of interest: the exposition of the experiences of women with GDM during pregnancy				
Context: in the experiences and feelings of women with GDM during pregnancy				
Synthesized finding	Type of research	Dependability	Credibility	ConQual score

Figure 3: ConQual Summary of Findings

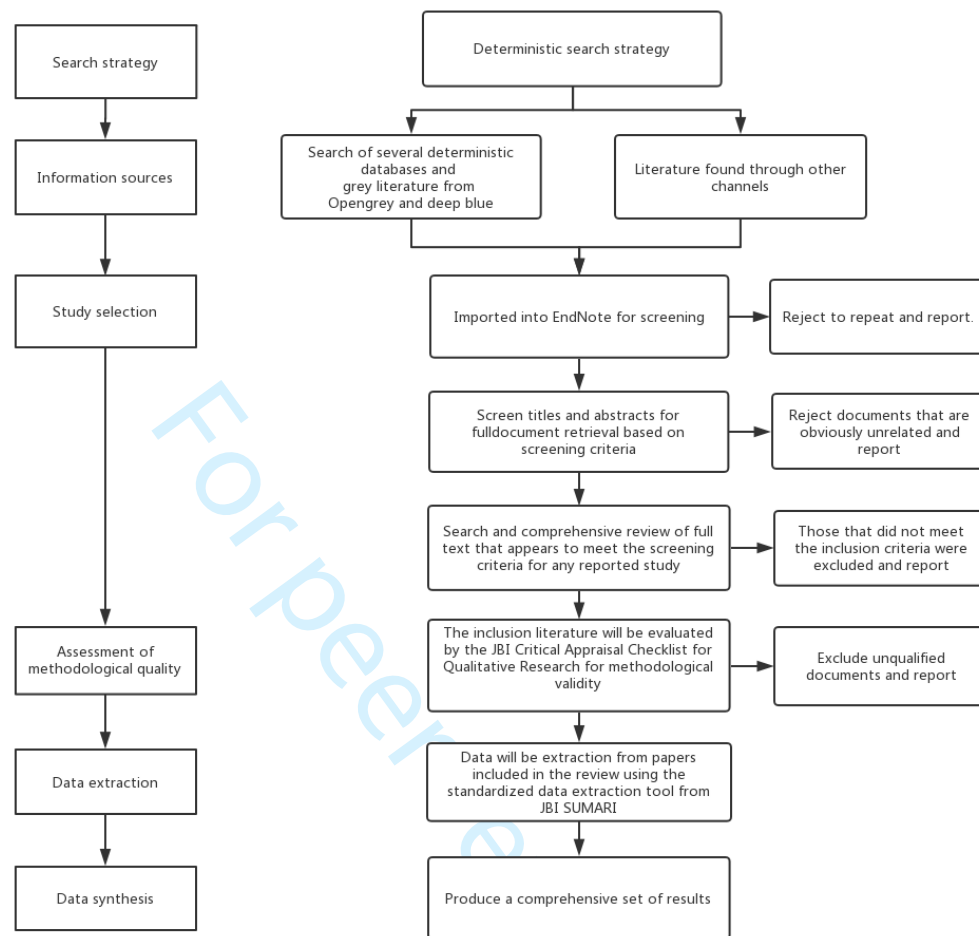


Figure 4: Search and selection process

Appendix I: Search strategy

PubMed

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#2 nursing methodology research [mh] OR research, nursing methodology [tiab] OR methodology research, nursing [tiab] OR nursing methodological issues research [tiab] OR clinical methodology research, nursing [tiab] OR organizational case studies [tiab] OR health services research [tiab] OR case stud*, organizational [tiab] OR studies, organizational case [tiab] OR management case studies [tiab] OR case studies, management [tiab] OR studies, management case [tiab] OR constant comparative method [tiab] OR constant comparison [tiab] OR content analysis [tiab] OR descriptive Research [tiab] OR discourse analysis [tiab] OR ethnography [tiab] OR exploratory [tiab] OR feminist [tiab] OR feminism [tiab] OR focus group* [tiab] OR grounded theory [tiab] OR hermeneutic* [tiab] OR interview [tiab] OR narrative [tiab] OR naturalistic [tiab] OR naturalistic inquiry [tiab] OR participant observation [tiab] OR phenomenology [tiab] OR qualitative method [tiab] OR qualitative research [tiab] OR qualitative stud* [tiab] OR thematic analysis [tiab]

#3 life change events [mh] OR event*, life change [tiab] OR life change event [tiab] OR life experience* [tiab] OR experience*, life [tiab] OR analysis, event history [tiab] OR analyses, event history [tiab] OR event history analyses [tiab] OR event history analysis [tiab] OR personal experience [tiab]

#4 #1 AND #2 AND #3

CINAHL Complete (EBSCO)

SU (Diabetes, Gestational OR Diabetes, Pregnancy-Induced OR Diabetes, Pregnancy Induced OR Pregnancy-Induced Diabetes OR Gestational Diabetes OR Diabetes Mellitus, Gestational OR Gestational Diabetes Mellitus OR GDM OR pregnancy diabetes mellitus) AND SU (nursing methodology research OR research, nursing methodology OR methodology research, nursing OR nursing methodological issues research OR clinical methodology research, nursing OR organizational case studies OR health services research OR case stud*, organizational OR studies, organizational case OR management case studies OR case studies, management OR studies, management case OR constant comparative method OR constant comparison OR content analysis OR descriptive Research OR discourse analysis OR ethnography OR exploratory OR feminist OR feminism OR focus group* OR grounded theory OR hermeneutic* OR interview OR narrative OR naturalistic OR naturalistic inquiry OR participant observation OR phenomenology OR qualitative method OR qualitative research OR qualitative stud* OR thematic analysis) AND SU (life change events OR event*, life change OR life change event OR life experience* OR experience*, life OR analysis, event history OR analyses, event history OR event history analyses OR event history analysis OR personal experience)

Embase

#1 'diabetes, gestational':ti,ab,kw OR 'diabetes, pregnancy-induced':ti,ab,kw OR 'diabetes, pregnancy induced':ti,ab,kw OR 'pregnancy-induced diabetes':ti,ab,kw OR 'gestational

diabetes':ti,ab,kw OR 'diabetes mellitus, gestational':ti,ab,kw OR 'gestational diabetes mellitus':ti,ab,kw OR gdm:ti,ab,kw OR 'pregnancy diabetes mellitus':ti,ab,kw

#2 'nursing methodology research':ti,ab,kw OR 'research, nursing methodology':ti,ab,kw OR 'methodology research, nursing':ti,ab,kw OR 'nursing methodological issues research':ti,ab,kw OR 'clinical methodology research, nursing':ti,ab,kw OR 'organizational case studies':ti,ab,kw OR 'health services research':ti,ab,kw OR 'case stud*', organizational':ti,ab,kw OR 'studies, organizational case':ti,ab,kw OR 'management case studies':ti,ab,kw OR 'case studies, management':ti,ab,kw OR 'studies, management case':ti,ab,kw OR 'constant comparative method':ti,ab,kw OR 'constant comparison':ti,ab,kw OR 'content analysis':ti,ab,kw OR 'descriptive research':ti,ab,kw OR 'discourse analysis':ti,ab,kw OR ethnography:ti,ab,kw OR exploratory:ti,ab,kw OR feminist:ti,ab,kw OR feminism:ti,ab,kw OR 'focus group*':ti,ab,kw OR 'grounded theory':ti,ab,kw OR hermeneutic*:ti,ab,kw OR interview:ti,ab,kw OR narrative:ti,ab,kw OR naturalistic:ti,ab,kw OR 'naturalistic inquiry':ti,ab,kw OR 'participant observation':ti,ab,kw OR phenomenology:ti,ab,kw OR 'qualitative method':ti,ab,kw OR 'qualitative research':ti,ab,kw OR 'qualitative stud*':ti,ab,kw OR 'thematic analysis':ti,ab,kw

#3 'life change events':ti,ab,kw OR 'event*', life change:ti,ab,kw OR 'life change event':ti,ab,kw OR 'life experience*':ti,ab,kw OR 'experience*', life:ti,ab,kw OR 'analysis, event history':ti,ab,kw OR 'analyses, event history':ti,ab,kw OR 'event history analyses':ti,ab,kw OR 'event history analysis':ti,ab,kw OR 'personal experience':ti,ab,kw

#4 #1 AND #2 AND #3

PsycINFO

SU (Diabetes, Gestational OR Diabetes, Pregnancy-Induced OR Diabetes, Pregnancy Induced OR Pregnancy-Induced Diabetes OR Gestational Diabetes OR Diabetes Mellitus, Gestational OR Gestational Diabetes Mellitus OR GDM OR pregnancy diabetes mellitus) AND SU (nursing methodology research OR research, nursing methodology OR methodology research, nursing OR nursing methodological issues research OR clinical methodology research, nursing OR organizational case studies OR health services research OR case stud*, organizational OR studies, organizational case OR management case studies OR case studies, management OR studies, management case OR constant comparative method OR constant comparison OR content analysis OR descriptive Research OR discourse analysis OR ethnography OR exploratory OR feminist OR feminism OR focus group* OR grounded theory OR hermeneutic* OR interview OR narrative OR naturalistic OR naturalistic inquiry OR participant observation OR phenomenology OR qualitative method OR qualitative research OR qualitative stud* OR thematic analysis) AND SU (life change events OR event*, life change OR life change event OR life experience* OR experience*, life OR analysis, event history OR analyses, event history OR event history analyses OR event history analysis OR personal experience)

China Biology Medicine disc

Abstract: ((Diabetes, Gestational OR Diabetes, Pregnancy-Induced OR Diabetes, Pregnancy Induced OR Pregnancy-Induced Diabetes OR Gestational Diabetes OR Diabetes Mellitus, Gestational OR Gestational Diabetes Mellitus OR GDM OR pregnancy diabetes mellitus) AND (nursing methodology research OR research, nursing methodology OR methodology research, nursing OR nursing methodological issues research OR clinical methodology research, nursing OR

organizational case studies OR health services research OR case stud*, organizational OR studies, organizational case OR management case studies OR case studies, management OR studies, management case OR constant comparative method OR constant comparison OR content analysis OR descriptive Research OR discourse analysis OR ethnography OR exploratory OR feminist OR feminism OR focus group* OR grounded theory OR hermeneutic* OR interview OR narrative OR naturalistic OR naturalistic inquiry OR participant observation OR phenomenology OR qualitative method OR qualitative research OR qualitative stud* OR thematic analysis) AND (life change events OR event*, life change OR life change event OR life experience* OR experience*, life OR analysis, event history OR analyses, event history OR event history analyses OR event history analysis OR personal experience))

China National Knowledge Infrastructure

Subject: ((Diabetes, Gestational OR Diabetes, Pregnancy-Induced OR Diabetes, Pregnancy Induced OR Pregnancy-Induced Diabetes OR Gestational Diabetes OR Diabetes Mellitus, Gestational OR Gestational Diabetes Mellitus OR GDM OR pregnancy diabetes mellitus) AND (nursing methodology research OR research, nursing methodology OR methodology research, nursing OR nursing methodological issues research OR clinical methodology research, nursing OR organizational case studies OR health services research OR case stud*, organizational OR studies, organizational case OR management case studies OR case studies, management OR studies, management case OR constant comparative method OR constant comparison OR content analysis OR descriptive Research OR discourse analysis OR ethnography OR exploratory OR feminist OR feminism OR focus group* OR grounded theory OR hermeneutic* OR interview OR narrative OR naturalistic OR naturalistic inquiry OR participant observation OR phenomenology OR qualitative method OR qualitative research OR qualitative stud* OR thematic analysis) AND (life change events OR event*, life change OR life change event OR life experience* OR experience*, life OR analysis, event history OR analyses, event history OR event history analyses OR event history analysis OR personal experience))

VIP Database for Chinese Technical Periodicals

Title and abstract= Diabetes, Gestational OR Diabetes, Pregnancy-Induced OR Diabetes, Pregnancy Induced OR Pregnancy-Induced Diabetes OR Gestational Diabetes OR Diabetes Mellitus, Gestational OR Gestational Diabetes Mellitus OR GDM OR pregnancy diabetes mellitus AND title and abstract= AND nursing methodology research OR research, nursing methodology OR methodology research, nursing OR nursing methodological issues research OR clinical methodology research, nursing OR organizational case studies OR health services research OR case stud*, organizational OR studies, organizational case OR management case studies OR case studies, management OR studies, management case OR constant comparative method OR constant comparison OR content analysis OR descriptive Research OR discourse analysis OR ethnography OR exploratory OR feminist OR feminism OR focus group* OR grounded theory OR hermeneutic* OR interview OR narrative OR naturalistic OR naturalistic inquiry OR participant observation OR phenomenology OR qualitative method OR qualitative research OR qualitative stud* OR thematic analysis title and abstract= life change events OR event*, life change OR life change event OR life experience* OR experience*, life OR analysis, event history OR analyses, event history OR event history analyses OR event history analysis OR personal experience

The Cochrane Library:

#1 (Diabetes, Gestational OR Diabetes, Pregnancy-Induced OR Diabetes, Pregnancy Induced OR Pregnancy-Induced Diabetes OR Gestational Diabetes OR Diabetes Mellitus, Gestational OR Gestational Diabetes Mellitus OR GDM OR pregnancy diabetes mellitus):ti,ab,kw

#2 (nursing methodology research OR research, nursing methodology OR methodology research, nursing OR nursing methodological issues research OR clinical methodology research, nursing OR organizational case studies OR health services research OR case stud*, organizational OR studies, organizational case OR management case studies OR case studies, management OR studies, management case OR constant comparative method OR constant comparison OR content analysis OR descriptive Research OR discourse analysis OR ethnography OR exploratory OR feminist OR feminism OR focus group* OR grounded theory OR hermeneutic* OR interview OR narrative OR naturalistic OR naturalistic inquiry OR participant observation OR phenomenology OR qualitative method OR qualitative research OR qualitative stud* OR thematic analysis) :ti,ab,kw

#3 (life change events OR event*, life change OR life change event OR life experience* OR experience*, life OR analysis, event history OR analyses, event history OR event history analyses OR event history analysis OR personal experience):ti,ab,kw

#4 #1 AND #2 AND #3

ISI Web of Science

TS=((Diabetes, Gestational OR Diabetes, Pregnancy-Induced OR Diabetes, Pregnancy Induced OR Pregnancy-Induced Diabetes OR Gestational Diabetes OR Diabetes Mellitus, Gestational OR Gestational Diabetes Mellitus OR GDM OR pregnancy diabetes mellitus) AND (nursing methodology research OR research, nursing methodology OR methodology research, nursing OR nursing methodological issues research OR clinical methodology research, nursing OR organizational case studies OR health services research OR case stud*, organizational OR studies, organizational case OR management case studies OR case studies, management OR studies, management case OR constant comparative method OR constant comparison OR content analysis OR descriptive Research OR discourse analysis OR ethnography OR exploratory OR feminist OR feminism OR focus group* OR grounded theory OR hermeneutic* OR interview OR narrative OR naturalistic OR naturalistic inquiry OR participant observation OR phenomenology OR qualitative method OR qualitative research OR qualitative stud* OR thematic analysis) AND (life change events OR event*, life change OR life change event OR life experience* OR experience*, life OR analysis, event history OR analyses, event history OR event history analyses OR event history analysis OR personal experience))

JBIR Database of Systematic Reviews

Abstract: Diabetes, Gestational OR Diabetes, Pregnancy Induced OR Diabetes, Pregnancy Induced OR Pregnancy Induced Diabetes OR Gestational Diabetes OR Diabetes Mellitus, Gestational OR Gestational Diabetes Mellitus OR GDM OR pregnancy diabetes mellitus; nursing methodology research OR research, nursing methodology OR methodology research, nursing OR nursing methodological issues research OR clinical methodology research, nursing OR organizational case studies OR health services research OR case stud*, organizational OR studies, organizational case OR management case studies OR case studies, management OR studies, management case OR

constant comparative method OR constant comparison OR content analysis OR descriptive Research OR discourse analysis OR ethnography OR exploratory OR feminist OR feminism OR focus group* OR grounded theory OR hermeneutic* OR interview OR narrative OR naturalistic OR naturalistic inquiry OR participant observation OR phenomenology OR qualitative method OR qualitative research OR qualitative stud* OR thematic analysis; life change events OR event*, life change OR life change event OR life experience* OR experience*, life OR analysis, event history OR analyses, event history OR event history analyses OR event history analysis OR personal experience

OpenGrey

("Diabetes, Gestational" OR "Diabetes, Pregnancy-Induced" OR "Diabetes, Pregnancy Induced" OR "Pregnancy-Induced Diabetes" OR "Gestational Diabetes" OR "Diabetes Mellitus, Gestational" OR "Gestational Diabetes Mellitus" OR "GDM" OR "pregnancy diabetes mellitus") AND ("nursing methodology research" OR "research, nursing methodology" OR "methodology research, nursing" OR "nursing methodological issues research" OR "clinical methodology research, nursing" OR "organizational case studies" OR "health services research" OR "case stud*, organizational" OR "studies, organizational case" OR "management case studies" OR "case studies, management" OR "studies, management case" OR "constant comparative method" OR "constant comparison" OR "content analysis" OR "descriptive Research" OR "discourse analysis" OR "ethnography" OR "exploratory" OR "feminist" OR "feminism" OR "focus group*" OR "grounded theory" OR "hermeneutic*" OR "interview" OR "narrative" OR "naturalistic" OR "naturalistic inquiry" OR "participant observation" OR "phenomenology" OR "qualitative method" OR "qualitative research" OR "qualitative stud*" OR "thematic analysis") AND ("life change events" OR "event*, life change" OR "life change event" OR "life experience*" OR "experience*, life" OR "analysis, event history" OR "analyses, event history" OR "event history analyses" OR "event history analysis" OR "personal experience")

Deep Blue

("Diabetes, Gestational" OR "Diabetes, Pregnancy-Induced" OR "Diabetes, Pregnancy Induced" OR "Pregnancy-Induced Diabetes" OR "Gestational Diabetes" OR "Diabetes Mellitus, Gestational" OR "Gestational Diabetes Mellitus" OR "GDM" OR "pregnancy diabetes mellitus") AND ("nursing methodology research" OR "research, nursing methodology" OR "methodology research, nursing" OR "nursing methodological issues research" OR "clinical methodology research, nursing" OR "organizational case studies" OR "health services research" OR "case stud*, organizational" OR "studies, organizational case" OR "management case studies" OR "case studies, management" OR "studies, management case" OR "constant comparative method" OR "constant comparison" OR "content analysis" OR "descriptive Research" OR "discourse analysis" OR "ethnography" OR "exploratory" OR "feminist" OR "feminism" OR "focus group*" OR "grounded theory" OR "hermeneutic*" OR "interview" OR "narrative" OR "naturalistic" OR "naturalistic inquiry" OR "participant observation" OR "phenomenology" OR "qualitative method" OR "qualitative research" OR "qualitative stud*" OR "thematic analysis") AND ("life change events" OR "event*, life change" OR "life change event" OR "life experience*" OR "experience*, life" OR "analysis, event history" OR "analyses, event history" OR "event history analyses" OR "event history analysis" OR "personal experience")